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## Original Communications

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### PREGNANCY AND HEART DISEASE FROM A MEDICAL VIEWPOINT\*

REPORT OF A STUDY OF FORTY CASES FROM THE SLOANE MATERNITY  
HOSPITAL, NEW YORK CITY

BY W. W. HERRICK, M.D., NEW YORK, N. Y.

#### INTRODUCTORY

THE obstetrician of the period of medical development now passing, in addition to dealing with the mechanical problems of labor, has too often borne alone the burden of manifold and often vital decisions respecting the care of the infant and the numerous problems of pregnancy proper to internal medicine. Among these the acute infections, the toxemias, and the myocardial insufficiencies in relation to pregnancy, parturition, and the puerperium are of such complexity and importance as to call forth the best endeavor of those practiced in both fields. In recognition of this fact, in the Sloane Hospital for Women during the past two years, a combined study of these problems has been made by the obstetrician and the internist. In publishing the result of these studies, the last named—the myocardial insufficiencies—will be first considered. The acute infections and the toxemias will be taken up in later papers. This paper, therefore, summarizes the experience with all cases showing symptoms of myocardial insufficiency delivered in the Sloane Hospital during the two years from October, 1919, to October, 1921.

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\*Read (by invitation) at a meeting of the New York Obstetrical Society, February 14, 1922.

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NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

## REVIEW OF LITERATURE

In reviewing the recorded experience of others in similar cases, one is impressed with the wide difference in results and opinions. A few examples may be quoted:

Harrar<sup>1</sup>, in a report of seventy-five cases with broken compensation during pregnancy, found an immediate maternal mortality of 30 per cent. He expressed the opinion that the prognosis improves the further along in pregnancy the woman is at the time of the first breakdown in circulatory balance. In nine cases in which the breakdown was between the ninth and tenth month, there was one death; of nine with the breakdown before the sixth month, seven died. In women giving history of broken compensation in previous pregnancies or before the present one, the mortality increases 60 to 70 per cent. Age and parity have little effect except in primipara. Hearts with a double mitral lesion are more prone to fail and to recover. Simple aortic lesions are most infrequent and have best recuperative power. Combined mitral and aortic disease is the most serious of all.

Longaker<sup>2</sup> states that the endeavor to carry these patients over months of increasing circulatory burdens to the period of fetal viability by rest and cardiac tonics after serious symptoms have developed is prone to spell disaster. "In the face of decompensation, there remains but one thing—empty the uterus."

Manges<sup>3</sup> proffers the opinion that cases of mitral stenosis when accompanied by mitral regurgitation usually have no trouble in labor and that mitral stenosis of the uncomplicated type is the only lesion giving trouble in pregnancy.

Hussey<sup>4</sup> believes that the majority of women with compensated heart disease go through pregnancy and labor without signs of decompensation. He states that the majority of fatalities occur some time after labor and believes that pregnancy may draw appreciably upon the store of cardiac reserve. He considers that the uterus should be emptied if broken compensation occurs early in pregnancy; if the patient has had broken compensation in former pregnancies; or if the symptoms of decompensation persist despite treatment.

Citing numerous writers, Hirschfelder<sup>5</sup> gives a mortality of 3 to 61 per cent in cases of valvular disease of the heart as a complication of pregnancy. Newell<sup>6</sup> believes that valvular disease of the heart complicating pregnancy may, for therapeutic purposes, be divided into two classes: The first, those showing decompensation early in pregnancy. These should have early abortion. The second, those showing decompensation in the latter period of pregnancy. These should have a second stage shortened and made as effortless as possible. In a later article, Newell<sup>7</sup> states that three per cent of pregnant women have cardiac complications which may be expected to react more or less seriously to the strain of pregnancy and labor. This writer is impressed with the reduction in reserve power in the heart resulting from childbearing and states his belief that every cardiac patient must pay for her child some price in length of days.

Blackers<sup>8</sup>, in a very satisfactory review of the entire subject, remarks: "It is certain that the majority of cases of valvular disease of the heart complicating pregnancy do perfectly well and pass through labor and the puerperium with no symptoms." In 453 collected cases, Blacker finds the mortality 12 per cent. He remarks that the nature of the valvular lesion is not of so much importance as the capacity of the myocardium—an opinion with which the majority of earlier writers are at variance—mitral stenosis being as a rule regarded as the more serious menace to the pregnant woman.

Feis<sup>9</sup> remarks upon the rarity of heart failure in pregnancy. He quotes the experience of Wissner in the Berne Frauenklinik, who in 4,000 births, noted but 25 such instances with but one fatality. From the reports of several observers, the same writer cites the following mortality rates in the condition under consideration: Wissner, 37.6 per cent; Schlayer, 48 per cent; Macdonald, 60 per cent; Leyden, 65 per cent; Guerard, 40 per cent; Schneider, 14 cases with one death; Benny Hart, 8 cases of mitral stenosis and 7 deaths; Vinay, in the Hotel Dieu, 20 cases and no deaths. In Schlayer's experience, but 46.5 per cent of children in cases of chronic valvular disease were carried to term. Twenty-nine per cent were born dead. Feis's experience leads him to the dictum that the probability of the survival of the child is so dubious that its life should not weigh greatly in the treatment of the mother.

Recently, Mackenzie<sup>10</sup> has written at length on this subject. His conclusions are, in general, not at variance with those of other writers. Few of these writers have stressed the importance of the purely medical treatment of cardiac decompensation in pregnancy, excepting Mackenzie<sup>11</sup> who says, "By bitter experience general practitioners have recognized that in certain diseased states of the heart there is great danger to the life of the woman and child. For over 50 years there have been many attempts to find out where the danger lies, and to recognize the signs which foretell disaster and the signs which need cause no anxiety. Yet the most recent of our textbooks show no advance on the views of 50 years ago."

"There is a physiologic problem involved, but no physiologist has attempted its solution. There are problems intimately connected with clinical medicine, yet physicians have no opportunity for studying the pregnant woman. The obstetrician sees her, but no obstetrician has yet learned the elements of cardiac symptomatology sufficiently to enable him to acquire the necessary information. Here is a problem of the first importance, which will, time and again, confront every general practitioner, and in the whole hierarchy of a medical school there is not one teacher or even group of teachers, capable of acquiring, far less of imparting, the necessary knowledge."

Most of the case reports deal with the purely obstetrical side of the matter, in which delivery is paramount. The larger number of patients have entered the obstetric hospitals at or near term—often late in labor, and under circumstances not affording opportunity for adequate medical measures. It seems clear that, no matter how skillfully labor be guided, it is the tardy recognition and care which is largely responsible for the high mortality in the cardiac disorders of pregnancy. The advantage to the patient of careful oversight throughout the entire antenatal period with the prompt institution of medical treatment in infections, toxemias, and cardiac conditions is unquestionable. This is more than a matter of opinion; it is a fact capable of ample proof.

#### MANAGEMENT OF CARDIAC CASES IN THE SLOANE HOSPITAL

The general plan of management of the pregnant woman with chronic disease of the heart is as follows: Pregnancy being a physiological process, we have taken the position that in the case of chronic cardiac disease with broken compensation, it is not the pregnancy, but

the heart condition which is the primary source of trouble. Therefore, where possible, pregnancy has been temporarily ignored and the first endeavor is the restoration of cardiac compensation before considering delivery. Of the greatest importance in accomplishing a satisfactory end result is the early recognition of disorders of the heart in the antenatal clinic. Cases presenting heart lesions are observed at very frequent intervals, and at the onset of unusual dyspnea, edema, palpitation, or other signs of decompensation, are admitted to the hospital and treated as cardiac cases. We would emphasize the importance of not instituting any measure looking toward delivery of the patient while symptoms of decompensation are present. Our own experience and review of the experience of others, has convinced us of the danger in hastening delivery in untreated cases of cardiac decompensation and has furnished proof of the high mortality in cases of decompensated cardiac disease delivered promptly upon their admission to obstetric hospitals. The greatest safeguard of the pregnant woman with chronic cardiac disease is, therefore, the antenatal clinic and prompt hospitalization at the first signs of serious decompensation.

The details of the medical treatment of this series of cases may thus be outlined: Rest in bed is usually enforced, but if the patient is more comfortable sitting in a chair, this is allowed. We have felt that the absolute prohibition of all bodily effort is not in every case necessary, and that it is possible some minor activity is an advantage in promoting the peripheral circulation, favoring venous return and thus reducing the strain on the heart. Adjuncts of value are massage and passive movements.

The diet is an ordinary, simple, light, well-balanced ration, the fluid content of which is somewhat limited, the average allowance of fluid being about fifteen hundred cubic centimeters in twenty-four hours. In cases with edema and signs of circulatory stasis, the Karrel diet, consisting of one quart of milk in twenty-four hours without intake of other solid or fluid, may be given for from two to five successive days until results appear. If, on this diet, thirst is annoying, cracked ice, fruit pulp, or chewing gum may be allowed. It is our experience that the Karrel diet is as satisfactory in the anasarca of pregnancy as in that accompanying decompensation apart from pregnancy. That there is an increased blood volume in pregnancy seems well established and is undoubtedly of great importance, and its reduction is accompanied by a very great improvement in most cases. With this purpose in view, along with diminished fluid intake, restriction of salt is enforced. Hydrogogue cathartics are of use in a few cases as an accessory measure in this comparative dehydration.

Digitalis is the most valuable single agent in restoring compensation. In cases presenting only slight symptoms of decompensation,

digitalis is given by the so-called "small dose method"—fifteen to twenty minims of a standardized tincture being administered three or four times a day until physiological effects are obtained. In the more pronounced cases of cardiac insufficiency requiring more prompt effects, one dram of the tincture is given three or four times daily for one or two days, followed by smaller doses. In a very few cases presenting grave symptoms of cardiac decompensation, the Eggleston "body weight" method is employed. In this, fifteen cubic centimeters of a standardized tincture for each one hundred pounds of body weight are administered within a period of twenty-four hours. The initial dose is one-half the total quantity. The three later doses consist of one-half the remaining amounts given at six hour intervals. In only one case—an emergency—was strophanthin, one milligram, given intravenously. This was an example of acute cardiac dilatation accompanying influenza. It is probable that the method by which digitalis is given is, in most cases, unimportant. The aim is to administer sufficient to produce the desired physiological action.

When satisfactory digitalis results are secured, as shown by lowered pulse rate, lessened pulse deficit, improvement in subjective symptoms, and in the establishment of diuresis, the effect of the drug is continued by administration of the tincture, minims twenty, every twenty-four hours—an amount which the studies of Pardee<sup>12</sup> have shown adequate for the continued action of the drug in the individual of average weight when once digitalization has been accomplished. In this plan of treatment, diuretics play a small part but are often useful in initiating diuresis when digitalis effects have begun to appear. One or two doses of diuretin, grains ten, or theocin, grains ten, may be given with profit.

The response of the majority of pregnant women with cardiac decompensation to treatment of this kind, suitably modified to fit individual requirements, is most satisfactory and is further proof of the familiar statement that "the average case of chronic valvular disease bears pregnancy well." In general, in this treatment, pregnancy may be ignored. If proper response is had, pregnancy may be allowed to proceed, the patient generally returning to her home to report for examination at weekly intervals and to be again hospitalized with the return of decompensation. Frequently, a woman will be admitted several times for weekly periods during the later months of pregnancy for the restoration of circulatory equilibrium. By such a program of intermittent hospitalization, the majority of women with weak hearts can be carried along, decompensation kept in abeyance and term approached with the heart in condition to bear the strain of labor.

Not every case responds happily to medical treatment. When satisfactory results do not ensue, decision as to the proper procedure frequently taxes the wisdom of the most experienced obstetrician and

internist, and is a matter of judgment in the individual case. There are so many factors of weight in this decision that no formula applicable to all cases can be worked out. These factors may be brought under two heads: First, medical, including the efficiency of the myocardium as shown by the degree of decompensation, the response to treatment, and, in multipara, its behavior in previous pregnancies. Second, the obstetric, including the size of the pelvis, size of the fetus, stage of pregnancy, state of the cervix, parity, efficiency of the mechanism of parturition, etc. If decompensation is marked and persists despite careful medical treatment, pregnancy should be terminated by the method entailing the least effort on the part of the patient. Any other course is full of danger. Further, the high fetal mortality already mentioned (Feis<sup>9</sup>), argues against the continuation of pregnancy when decompensation is unyielding and severe. If decompensation occurs early in pregnancy and if former pregnancies have resulted in severe damage to the myocardium, abortion is generally advisable.

There are numerous cases in which cardiac symptoms do not become severe until the latter half of pregnancy and, while showing improvement, do not entirely disappear under medical treatment. A certain number of these borderline cases may be carried along with careful observation in the hospital to term or to fetal viability when normal labor or induction may be passed through with success. It may be said that more of these cases than seems possible go through successful childbearing without serious event. In making decision in cases of this sort, much depends upon the attitude of the woman. If, for the sake of offspring, she is willing to take the risk of acute dilatation during or after labor and of decline in cardiac efficiency afterward, this has a certain weight in the decision.

If the period of fetal viability is reached, further decision must be made. Shall the pregnancy proceed to term? If not, how shall it be ended? If obstetric conditions indicate the necessity of cesarean section and if decompensation impends, this measure may be taken so soon as a living child is assured. If, however, obstetric conditions promise a second stage free from undue effort and decompensation can be warded off, it is usually wiser to allow continuation to term when a more facile parturition is assured than to embark upon the uncertain course of an induced labor in advance of term. In certain cases at term in which an easy second stage is not probable, cesarean section may be the wise course even if the heart condition is well under control.

Upon the management of labor depends, to a large extent, the future efficiency of the myocardium. While the majority of women with heart disease will pass through labor with safety, a certain number will show permanent decline in reserve vigor of the heart. It is to

spare this that cesarean section is often resorted to. Again, this gives opportunity for sterilization when this seems advisable.

During labor, the physician is chiefly concerned with the shortening and lightening of the second stage. It is probable that the uterine contractions do not in themselves greatly burden the circulation. Aside from the circulatory demands of increased metabolism and the psychic effect of the pain, such contractions of masses of involuntary muscle may be disregarded as important factors in any circulatory disturbances accompanying pregnancy. It is the play of the entire mechanism of the second or expulsive stage that is the chief danger to the compromised heart. The contraction of the voluntary muscles, the forced depression of the diaphragm, the holding of the breath during efforts to expel the fetus, is a strain as real as it is immeasurable in precise terms of work performed. The expulsion of the fetus with the consequent decrease in intraabdominal pressure is itself a source of embarrassment to the circulation. The intrathoracic pressure relations are altered greatly and suddenly. As Pouliot<sup>13</sup> has insisted, the lower position of the diaphragm immediately following parturition has an effect on the lungs not unlike that following the removal of a large pleural effusion, under which conditions one may rarely observe an acute edema of the lungs. This, in Pouliot's mind, explains the pulmonary edema occurring so frequently immediately postpartum. That this sudden decline in intrathoracic pressure is more of a menace in mitral stenosis than in other conditions is understandable when we consider the greatly increased tension in the pulmonary circulation in this valve lesion. It would appear that herein lies one of the important causes which justifies the view that mitral stenosis is attended by more risk in childbearing than is any other heart lesion. The necessity of making this second stage of labor as short and easy as possible has long been recognized by obstetricians. The means of accomplishing this must vary with each case and are important enough to demand separate discussion.

#### COMPLICATIONS

With the completion of labor, the menace which threatens the decompensated heart is by no means abolished. The obstetrician is well aware of the possibility of an acute pulmonary edema within a few hours, or even twelve or fourteen days following parturition. The cause of this dangerous symptom is a matter of debate. Three factors, operating singly or in combination, seem important. We have already mentioned the sudden diminution of pressure upon the lung resulting from the expulsion of the fetus which, particularly in mitral stenosis, with its greatly increased pressure in the pulmonary circulation, may act in the same manner in promoting pulmonary edema as the with-



drawal of a large pleural effusion. Similar train of cause and effect might rarely be observed in mitral insufficiency as well.

The mechanical theory of Welch may be invoked as a fairly satisfactory explanation of certain types of pulmonary edema,—particularly those following severe toxemia with prolonged arterial hypertension. It is probable that sudden failure of the left ventricle under the strain with continued normal and, therefore, disproportionately great activity on the part of the right ventricle may result in great pulmonary congestion and transudation. This type of circulatory imbalance often occurs several days after parturition and especially with the establishment of lactation. The metabolic demands of this function, the redistribution or increase in amount of body fluids may, each or all, be factors. There would seem little question of the important rôle of increased blood volume in this type of pulmonary edema of pregnancy. The frequent practice of flooding the body with enormous quantities of water when toxemia is present is one that requires great discrimination. When toxemia is accompanied by arterial hypertension or circulatory stasis, great increase in fluid intake may spell disaster. Toxic effects on the endothelium of pulmonary capillaries increasing permeability is doubtless a real but variable and imponderable factor. So is the toxic degeneration of the myocardium in the so-called mechanical type. Bronchospasm as a cause of the pulmonary edema of childbearing seems of little importance.

The immediate treatment of severe pulmonary edema calls for prompt bleeding. During labor, this may be accomplished by promoting loss of blood from the uterus. Otherwise, venesection is demanded. Since reduction in venous pressure follows only after the withdrawal of sixteen ounces or more of blood from the individual of average weight, at least that amount should be taken. Morphine, grains one quarter, hypodermically is essential. Entire quiet is enforced. In cases with arterial hypertension, nitroglycerine is valuable. One one-hundredth grain is given every five minutes until effect is had. The further treatment of such a case is that of the decompensated heart after labor.

#### TREATMENT OF THE DECOMPENSATED CASE AFTER LABOR

This includes bed rest, the Karrel diet in cases with edema, otherwise moderate restriction of fluids, digitalis to tolerance, sedatives as required, and diuretin at intervals if indicated. Massage and passive movements are begun promptly. Later, exercise is allowed provided the response is satisfactory. If a given effort does not result in an acceleration of the pulse of more than twenty beats per minute, and if, after two minutes, the rate return to within five or ten beats of the previous resting rate, the bounds of cardiac capacity have probably not been passed. The more complex and, theoretically, more exact

tests of the functional capacity of the myocardium are probably no more satisfactory than this simple exercise test. Governed by this test, the patient may gradually resume activity. In general, about one month of rest in bed or chair, followed by graduated activity under careful supervision is necessary. In cases exhibiting dilatation of the heart, the return of the apex impulse to its former site, a change to a more normal character, and the disappearance of the murmurs indicating a relative mitral insufficiency, are important preliminaries to activity and must, in selected examples, supplement the exercise test.

Digitalis should be continued in therapeutic doses during this convalescent period. The person of average weight will tolerate about twenty minims of the standard tincture daily. Some will profit by larger amounts. Others will exhibit extrasystoles, ventricular tachycardia, nausea, or other evidences of toxic action, and should have the drug at intervals rather than by a continuous method.

Many women tend to gain weight unduly during the months following childbirth. The danger of this to the cardiac patient is obvious. In controlling this matter, studies of the basal metabolism and chemical survey of the blood are desirable and may unmask metabolic or endocrine defects of importance. Where such refinements are not available, quantitative restriction of diet with disproportionate reduction in carbohydrate often gives practical results that are satisfactory. Judicious exercise and thyroid extract given with caution may supplement this diet.

*Anesthesia.*—It is our opinion that much of the apprehension of the possible ill effects of anesthesia in instances of chronic heart disease is not justified by practical experience. In our series, a judiciously given ether anesthesia was, without exception, well borne. In these cases, ether has been preferred to other anesthetics by the operating staff.

*Mitral Stenosis.*—While the not infrequent statement that this lesion is incompatible with a safe pregnancy is certainly not warranted by experience, mitral stenosis should be regarded more earnestly than other valvular defects. This is especially true of cases giving such evidence of great narrowing of the mitral ring as a lengthy murmur and thrill extending throughout diastole, constant rapidity of the heart rate, cyanosis, exertional dyspnea, and signs of stasis however slight. In such cases, pregnancy should be avoided or terminated. Curiously, the danger of embolism does not seem to be increased by pregnancy.

One case of mitral stenosis (hospital number 44733) illustrated very convincingly the mechanism of the Graham-Steell murmur of relative pulmonary insufficiency. Before labor the signs were those of a marked involvement of the mitral valve with stenosis and insufficiency and accentuation of the second sound at the pulmonic area. After delivery, a soft diastolic murmur appeared at the pulmonic area and

in the third and fourth spaces to the left of the sternum. With this, the second sound at the pulmonic area became very faint. In ten days the diastolic murmur vanished and the pulmonic sound was again loud and distinct.

*Auricular Fibrillation.*—In 1921, Thomas<sup>14</sup> remarked that he could find in all the literature no “mention of cardiac arrhythmia in pregnancy or any cases of auricular flutter or fibrillation accompanying that state.” To Thomas’ report of a seriously decompensated case with fibrillation that went through labor without great embarrassment of the heart, I add four cases showing fibrillation of the auricle. All of these underwent therapeutic abortion excepting one in whom the arrhythmia was transitory and immediately followed labor. In this case, within a few hours, a normal rhythm was restored and no cardiac symptoms have since been experienced.

Auricular fibrillation being most often a sequel of marked mitral stenosis would, in general, interdict pregnancy. However, those rare cases with adequately maintained circulation and some margin of cardiac reserve power might bear children with reasonable safety.

*Auricular Flutter.*—This occurred once as an incident immediately postpartum. It vanished within a few hours and no trace of heart trouble could be detected several months later.

#### THE PERMANENT EFFECTS OF PREGNANCY ON THE DISEASED HEART

Do pregnancy and labor permanently reduce the reserve power of the diseased heart? Only careful study of cases for several months or years postpartum can give a satisfactory answer to this question. In general, experience indicates that the scriptural principle applies: “To him that hath shall be given, and from him who hath not shall be taken away even that which he hath.” The woman with little dilatation and fair reserve power in the heart muscle may, six months after parturition, reveal no decline in circulatory efficiency, while the more gravely afflicted show permanent injury. Even among this latter class, however, are startling exceptions. One may see with astonishment a woman with a narrow mitral ring and permanent auricular fibrillation, or one with recurring and severe decompensation, pass through more than one labor without apparent increase in cardiac discomfort. Satisfying explanations of some of these cases cannot be given. Of one matter, however, we may be certain; such good results depend very largely upon the care given before, during and after labor. Of greatest importance is the prevention of serious decompensation by the prompt institution of medical treatment with the earliest onset of its symptoms. If this is accomplished, if the labor is made free from undue stress by appropriate obstetric measures, and if resumption of activity postpartum be carefully adjusted to the

capacity of the heart, the patient may, as a rule, look forward to a restoration of cardiac reserve power at or near the former level.

For this, there seems good reason. Pregnancy is a physiological process. Cardiac decompensation accompanying it is the result of added burdens largely of a mechanical sort, such as increased blood volume, increased body bulk, increased metabolic demands, high position of the diaphragm with its effect on heart and lungs. In the absence of toxemia, such decompensation is not the result of any inflammatory or degenerative process involving the myocardium such as so generally underlies the cardiac failure of most other states. The therapeutic problem is, therefore, measurably simpler, more promising and more successful in pregnancy than under most circumstances.

Examination of some thirty of our cases from six weeks to twelve months postpartum reveals the satisfactory fact that there are few exceptions showing either by history or physical signs appreciable decline in circulatory efficiency as a result of the pregnancy. Exceptions have been those becoming obese, those suffering further inroads of rheumatic infection and one example of syphilitic aortitis that has continued on the expected downward course.

Details of the forty cases upon which this paper is based are found in the accompanying tabulation. Of the two deaths, one was a case of influenzal pneumonia with decompensated heart and edema of the lungs. She entered in a moribund state and died shortly after admittance. The second death was in a case of marked mitral stenosis delivered in the Sloane Hospital one year before. This patient was advised to consent to termination of pregnancy, but refused, dying from acute dilatation the day following admission.

#### THE EFFECT OF CHRONIC HEART DISEASE UPON THE FETUS

In this series of forty cases, there were ten fetal deaths. Of these, three were therapeutic abortions, four were stillbirths, one died about one hour after birth and one was a stillbirth following a postmortem cesarean section. One maternal death occurred without delivery. As might be expected, the fetal mortality was greatest in mitral stenosis with concomitant toxemia of pregnancy. The influence of chronic valvular disease of the heart upon the size of the fetus is of interest. The average weight of the children of the cardiac cases delivered at term and here reported was six pounds and ten ounces. This may be compared with the average weight at birth of seven and one-tenth pounds as given by Holt.

#### SUMMARY

Experience of two years with forty cases of chronic valvular disease in pregnancy has emphasized the importance of the following points:

1. An antenatal clinic is essential in detecting the early evidences of decompensation.

2. All cases showing decompensation in any period of pregnancy should be admitted to the hospital and given medical treatment, no matter what the stage of pregnancy.

3. Induction of labor should never be attempted in a case of decompensation until thorough trial has been made of medical measures.

4. The response to medical treatment of the average case of chronic valvular disease of the heart in pregnancy is satisfactory, and the same principles govern its treatment as govern the treatment of such cases not associated with pregnancy.

5. The termination of pregnancy in the presence of chronic valvular disease of the heart is not a matter about which hard and fast rules can be laid down. In general, if decompensation occurs early in pregnancy, or if it does not respond to medical treatment, if it has occurred and been severe despite proper care in previous pregnancies and if the signs and symptoms indicate serious lesion, termination is usually wise.

6. The method by which pregnancy should be terminated is largely an obstetric question, the point of greatest importance being the guarantee of a short and easy second stage.

#### SUMMARY OF CASES

1. Age twenty-six. Gravida 2. Admitted August 31, 1921. Complaint of headache and edema when admitted. Signs of mitral stenosis. Pulse rate 100. Delivered normally on day of admission. Discharged September 12, 1921, in good condition. Diagnosis: mitral stenosis.

2. Age twenty-two. Primipara. Admitted November 26, 1920. History of sore throats, scarlet fever and tonsillitis. Admitted with mild cardiac insufficiency. Signs of mitral stenosis. Delivered at term by Maurician extraction. Postnatal examination, June 14, 1921: No symptoms of heart weakness, slight hypertrophy; response to exercise, fair. Diagnosis: mitral stenosis, moderate hypertrophy, little dilatation. General outlook good.

3. Age thirty-seven. Gravida 3. Admitted December 13, 1919. Tonsillitis and arthritis in 1911. Symptoms of moderate cardiac insufficiency with signs of mitral stenosis. Blood pressure, 190/130; albuminuria. Improvement under treatment. Normal delivery at term six days after admission. Postnatal examination, June 14, 1921: Dyspnea on exertion, moderate hypertrophy of heart; blood pressure, 190/130. Diagnosis: essential hypertension, mitral stenosis; hypertrophy, slight dilatation of heart; toxemia of pregnancy.

4. Age thirty-three. Gravida 3. Admitted January 12, 1921. Pneumonia at 18 followed by heart trouble. Rheumatic fever at 13. Admitted with cardiac insufficiency, considerable hypertrophy and dilatation, and signs of mitral stenosis. Improvement under treatment. Delivery January 16th by medium forceps. Diagnosis: mitral stenosis. Outlook good.

5. Age thirty-one. Gravida 4. Admitted August 25, 1920. History of diphtheria and rheumatic fever. Cardiac symptoms for four years. Signs of mitral insufficiency on admission. Normal delivery on day of admission. Convalescence satisfactory. Diagnosis: mitral insufficiency.

6. Age twenty-six. Gravida 2. Admitted April 23, 1921. Past history negative. Dyspnea and signs of mitral insufficiency on admission. April 23, normal delivery. Postnatal examination June 28, 1921, showed the heart normal in size, position, and sounds. Diagnosis: mitral insufficiency, possibly relative.

7. Age twenty-three. Gravida 2. Admitted April 11, 1921. History of cardiac symptoms for several years. Signs of mitral insufficiency on admission but no signs of decompensation other than dyspnea on effort. Delivery was normal at term, April 11th. Postnatal examination July 5, 1921, showed no cardiac symptoms. A faint systolic murmur could be heard at the apex of the heart which was normal in size. Diagnosis: mitral insufficiency.

8. Age thirty-seven. Gravida 6. Admitted December 7, 1920. History of scarlet fever with kidney trouble at seven years, also a history of chorea and rheumatic fever. Threatened miscarriage three weeks before admission. Dyspnea with headache and edema and signs of mitral insufficiency and toxemia of pregnancy on admission. Blood pressure, 200/130; albuminuria, 100 per cent by volume. Labor was induced at the sixth month and a stillborn child delivered. Satisfactory convalescence. Diagnosis: mitral insufficiency; toxemia of pregnancy. At postnatal clinic, May 26, 1921, no complaint of cardiac symptoms was made. There was slight cyanosis and some edema of ankles, moderate hypertrophy and dilatation, signs of mitral insufficiency and hypertension. Blood pressure, 206/116. Outlook poor.

9. Age thirty-five. Gravida 4. Admitted January 29, 1920. History of influenza and malaria. Marked dyspnea and palpitation on admission. There were signs of mitral insufficiency. Blood pressure, 146/88. Labor was induced at the eighth month and a living child delivered. Condition on discharge was excellent. Diagnosis: mitral insufficiency. Examination in postnatal clinic, June 14, 1921, showed dyspnea, and edema of feet. There was obesity, the left ventricle was hypertrophied with signs of mitral insufficiency. Blood pressure was 180/110. Response to exercise was poor. Diagnosis: essential hypertension, obesity, relative mitral insufficiency. Outlook poor.

10. Age twenty-five. Gravida 3. Admitted August 28, 1920. History of tonsillitis and heart trouble. Eclampsia in 1917, since which, dyspnea, headaches and edema had been present. Admitted with signs of mitral insufficiency and toxemia of pregnancy. Blood pressure, 140/80; urine, albumin, 60 per cent by volume with casts. Five days later, delivery was normal after which the condition improved. Diagnosis: mitral insufficiency, toxemia of pregnancy.

11. Age thirty-nine. Gravida 7. Admitted October 12, 1920. History of heart trouble at 6 years and rheumatic fever in 1912. Admitted with edema, a trace of albumin in the urine, and signs of mitral insufficiency. Normal delivery on the day of admission. Diagnosis: mitral insufficiency, slight decompensation. Examination in postnatal clinic, June 14, 1921, showed moderate hypertrophy and signs of mitral insufficiency. No dyspnea except on unusual exertion or excitement. Outlook good.

12. Age thirty-two. Gravida 4. Admitted July 30, 1921. Moderate dyspnea, edema and cyanosis on admission. Very obese. In hospital nine weeks before labor, two weeks of which were spent in bed. Digitalis administered. Considerable hypertrophy but little dilatation; compensation fairly good. Normal delivery September 12. Condition improved. Diagnosis: mitral stenosis and insufficiency.

13. Age twenty-four. Primipara. Admitted February 3, 1920. Rheumatic fever at 12. At 21, was in the hospital because of heart condition. Admitted with marked decompensation, cardiac dilatation and hypertrophy, rate of 140, and signs of mitral stenosis and insufficiency. Moderate toxemia of pregnancy. De-

livery one week later at term by medium forceps. Child stillborn. Postnatal examination, May 26, 1921, poor response to exercise, marked hypertrophy, moderate dilatation. Diagnosis: mitral stenosis and insufficiency; toxemia of pregnancy. Outlook poor.

14. Age thirty-eight. Gravida 4. Admitted June 19, 1920. No antenatal care. Admitted in labor. Heart: hypertrophy and slight dilatation; some edema, infected teeth. Labor normal. June 28, 1921, at follow-up clinic, complained of dyspnea. The heart showed moderate hypertrophy and dilatation, mitral stenosis and insufficiency with impaired reserve power. Outlook only fair.

15. Age thirty-five. Gravida 2. Admitted July 12, 1921. Rheumatic fever as child. Latent cardiac trouble for years. No trouble with heart in labor nine years before. At sixth month of present pregnancy, had acute tonsillitis followed by palpitation, rapid, irregular heart action, dyspnea, nervousness. Slight hypertrophy, rate 130 with periods of grouped extrasystolic irregularities. Systolic and presystolic murmurs at apex. No stasis. Treatment: rest and digitalis with improvement. July 21, Cesarean section. Convalescence and eventual heart condition satisfactory. Diagnosis: mitral stenosis and insufficiency, acute infectious myocarditis following tonsillitis.

16. Age twenty-eight. Primipara. Admitted April 22, 1920. History of poliomyelitis at 2. Cardiac insufficiency for nine years, marked for past six months. Admitted with edema, albuminuria, and other evidence of pregnancy toxemia, mitral stenosis and insufficiency. Blood pressure 188/110. No improvement under treatment. Labor induced at the sixth month, four days after admission, after which, the heart became compensated. Diagnosis: mitral stenosis and insufficiency, secondary anemia, severe toxemia of pregnancy.

17. Age twenty-four. Primipara. Admitted February 17, 1921. Admitted with marked dyspnea, orthopnea, and edema. The heart was so over acting that no definite evidence of valvular lesion could be made out. There was albuminuria. Delivery, seventeen days later, was at term and normal, but during labor the pulse rate was 170 and the quality very poor. Compensation was restored soon after labor. Postnatal examination, June 14, 1921, showed cardiac hypertrophy of moderate grade. Diagnosis: mitral stenosis and insufficiency. Prognosis good.

18. Age twenty-eight. Gravida 3. Admitted July 10, 1920. Influenza and pneumonia in 1919. Earlier in pregnancy was admitted with dyspnea and edema, moderate hypertrophy of heart and congestion of lungs and was treated for fifteen days with improvement. Normal delivery on day of second admission. Convalescence satisfactory and condition good when discharged. Diagnosis: mitral stenosis and insufficiency.

19. Age thirty. Primipara. Admitted September 21, 1920. Rheumatic fever at 5 and at 10. Known cardiac disease since 12. In the ninth month of pregnancy, partial decompensation with marked hypertrophy and signs of mitral stenosis and insufficiency. Marked improvement after rest. Normal delivery September 28, 1920. Diagnosis: mitral stenosis and insufficiency.

20. Age twenty-one. Primipara. Admitted February 10, 1920. History of measles only. Admitted with marked dyspnea and enlargement of the heart, a rate of 120, and signs of mitral stenosis and insufficiency. Version and breech delivery at term on day of admission. Postnatal examination, June 28, 1921. Dyspnea on effort, marked hypertrophy and moderate dilatation. Diagnosis: mitral stenosis and insufficiency. Outlook fair.

21. Age twenty-eight. Gravida 2. Admitted February 26, 1921. Dyspnea and edema for two years, worse during pregnancy. Hemoglobin, 35 per cent. Ova of

uncinaria in stool. Heart: moderate hypertrophy and slight dilatation. Systolic and presystolic murmurs at apex. Spleen enlarged. Wassermann,  $\mp$ . Treatment: transfusion, digitalization, neosalvarsan. Delivery normal, March 6th. Much improved on leaving hospital. Diagnosis: mitral stenosis and insufficiency.

22. Age twenty-seven. Gravida 4. Admitted August 9, 1920. History of positive Wassermann reaction. Mild cardiac insufficiency for two months. Admitted with the signs of mitral stenosis and insufficiency of moderate degree, and of healed pulmonary tuberculosis. Delivery normal. Diagnosis: mitral stenosis and insufficiency.

23. Age twenty-eight. Gravida 2. Admitted March 15, 1920. History of rheumatic fever at 18, of repeated quinsy, of diphtheria and scarlet fever. Heart trouble for two years. Admitted with hypertrophy and dilatation, signs of mitral stenosis and insufficiency. Marked improvement followed treatment. April 2, normal delivery at term. Postnatal examination May 26, 1921. No symptoms of cardiac insufficiency. Diagnosis: mitral stenosis and insufficiency.

24. Age twenty-six. Gravida 2. Admitted September 26, 1921. Repeated tonsillitis. In Sloane Hospital in April, 1920, with toxemia of pregnancy. Labor induced. On admission, decompensated, showing dyspnea, cough, edema. In December, 1921, in hospital three weeks. Because of decompensation, abortion advised but refused. September 26, heart hypertrophied and moderately dilated, rate 100, regular. Presystolic and systolic murmurs at apex, stasis at bases of lungs, massive edema of legs and feet. Advancing decompensation. Death, September 28, 1921, from pulmonary edema.

25. Age twenty-seven. Primipara. Admitted May 25, 1920. Influenza in 1918. Severe toxemia with blood pressure, 225/120; albuminuria, edema, signs of mitral stenosis and insufficiency. Delivery the day following admission by forceps. Convulsion during labor and two afterwards. Full-term stillbirth. Diagnosis: mitral stenosis and insufficiency, eclamptic toxemia of pregnancy.

26. Age twenty-nine. Gravida 3. Admitted April 17, 1920. Past history included influenza and five attacks of rheumatic fever; also, diphtheria, scarlet fever, tonsillitis, and chorea. Marked cardiac insufficiency, hypertrophy and dilatation. Delivery, April 29th, was normal at term. Following delivery for ten days had Graham-Steell murmur. Discharged in good condition. Outlook satisfactory. Diagnosis: mitral stenosis and insufficiency, transitory relative pulmonary insufficiency.

27. Age twenty-seven. Gravida 2. Admitted March 9, 1920. History of rheumatic fever at sixteen years. Headache and slight cyanosis present but no dyspnea or edema. There were signs of mitral and aortic insufficiency with moderate enlargement of the left heart. Delivery was normal on the day of admission. Diagnosis: aortic and mitral insufficiency, mitral stenosis.

28. Age twenty-four. Gravida 1. Admitted March 21, 1920. History of tonsillitis, quinsy, and rheumatic fever. Cardiac symptoms for one year. Dyspnea, orthopnea, edema and some cyanosis on admission. Signs of aortic and mitral insufficiency with auricular fibrillation and a pulse rate averaging 100. There were a few coarse rales at the bases of the lungs. By medical treatment, compensation was restored in five days and the patient left the hospital returning in labor March 21st. Delivery was normal at term. Postnatal examination on June 14, 1920, revealed some cyanosis, a pulse rate of 88 and regular, marked hypertrophy and dilatation with general outlook poor. Diagnosis: mitral and aortic insufficiency.

29. Gravida 2. Admitted June 4, 1921. History of dyspnea, edema, and signs of mitral stenosis and insufficiency beginning with and continuing since first preg-



nancy. Labor, June 10, was terminated by forceps, eliminating the second stage. Postnatal examination, June 28, 1921, showed moderate hypertrophy and dilatation with excellent compensation. Diagnosis: mitral stenosis and aortic insufficiency.

30. Age twenty-one. Gravida 1. Admitted October 14, 1919. History of several attacks of rheumatic fever. Entered hospital with failing compensation, cough, and extreme edema. After six weeks of medical treatment and a trial labor of five hours, a cesarean section and sterilization were done. Convalescence was satisfactory. Diagnosis: mitral stenosis and insufficiency, possible aortic insufficiency, functional pulmonary leakage.

31. Age thirty-nine. Primipara. Admitted November 17, 1919. History of rheumatic fever nineteen years before. Admitted in labor with marked edema. Signs of mitral and aortic insufficiency. Labor was terminated by a medium forceps delivery November 18, 1919. Postnatal examination, May 26, 1921, showed marked hypertrophy, little dilatation and fairly good compensation. Diagnosis: mitral stenosis and insufficiency; aortic insufficiency.

32. Age thirty-nine. Gravida 6. Admitted March 17, 1920. History of measles. Slight cyanosis and edema on admission. The liver was palpable. Normal delivery at term ten days later. Condition satisfactory. Postnatal examination, May 26, 1921, revealed considerable hypertrophy but little dilatation. Diagnosis: mitral stenosis and aortic insufficiency.

33. Age thirty-eight. Gravida 10. Admitted April 17, 1920. History of subacute rheumatic fever. Dyspnea and marked edema for one month previous to admission. Signs of mitral stenosis and aortic insufficiency. Delivery was at term, April 8th, the child living about one hour. Diagnosis: mitral stenosis and insufficiency; aortic insufficiency.

34. Age twenty-eight. Primipara. Admitted September 27, 1920. History of diphtheria at two years, frequent colds and tonsillitis. No cardiac symptoms noted on admission. Delivery the day of admission was followed by cyanosis and signs of some enlargement of the right heart with auricular flutter. Eight hours later, the pulse was normal. Postnatal examination, May 26, 1921, revealed no heart lesion. Diagnosis: transitory dilatation of the heart with auricular flutter immediately postpartum.

35. Age twenty-four. Gravida 3. Admitted September 27, 1920. No history of previous illnesses. The physical examination was negative on admission. Immediately following delivery, breathing stopped and the heart became totally irregular with auricular fibrillation. In an hour the respirations were normal and the heart again regular. The patient left the hospital in good condition without evidence of valvular lesion. Diagnosis: transitory auricular fibrillation immediately postpartum.

36. Age forty-two. Gravida 13. Admitted May 3, 1921. Rheumatic fever seventeen years before. Moderate decompensation for two years. Heart showed dilatation and hypertrophy, rate 92, totally irregular with pulse deficit of 40. Systolic and diastolic murmurs at apex. Liver and lungs congested. Spent one month in bed with disappearance of cyanosis and edema and pulse deficit. July 14, reentered hospital in labor. Version under ether. Mother's condition good. Child died. July 21, 1921, compensation was good and patient's condition was much better than on May 3rd. Diagnosis: mitral stenosis and insufficiency; auricular fibrillation.

37. Age thirty-nine. Gravida 9. Admitted April 13, 1920. Rheumatic fever and long standing cardiac disease. Cerebral embolism one month before admission. Heart: moderate hypertrophy and dilatation, auricular fibrillation, congestion of

TABLE I.—SUMMARY OF CASES

LESIONS	NUMBER OF CASES	ANTECEDENT HISTORY				COMPLICATION		TREATMENT						RESULT		
		RHEUMATIC FEVER	TONSILLITIS	CHOREA	SCARLET FEVER	SECONDARY ANEMIA	TOXEMIA OF PREGNANCY	REST AND DIGITALIS	NORMAL LABOR	INSTRUMENTAL DELIVERY	THERAPEUTIC ABORTION	CEASAREAN SECTION	STERILIZATION	AVERAGE WEIGHT OF CHILD	MATERNAL DEATHS	FETAL DEATHS
Mitral Stenosis, pure	4	2	1				3	3	2	2				6 lb. 10 oz.	0	1
Mitral Insufficiency, pure	7	3	1	1	1		3	3	5	2				6 lb. 14 oz.	0	0
Mitral Stenosis and Insufficiency	14	4	3		1	6	4	6	9	2	1	1	1	6 lb. 12½ oz.	1	4
Mitral Stenosis and Insufficiency and relative Pulmonary insufficiency	1	1	1	1	1			1	1					6 lb. 9 oz.	0	0
Aortic and Mitral Lesions	7	5	1					3	4	2		1	1	7 lb. 3 oz.	0	1
Auricular Flutter	1		1							1					0	0
Auricular Fibrillation	1								1						0	0
No Valve Lesion	3	2		1		1	2	3	1		3			6 lb. 11 oz.	0	3
Auricular Fibrillation with Valve Lesion	1							1				1			0	0
Aortitis	1						1	1							1	1
Post-Infectious Cardiac Decompensation	1						1									
TOTAL	40	17	8	3	3	7	13	20	23	9	4	3	2	6 lb. 10 oz.	2	10

liver and lungs. Incomplete left hemiplegia. Therapeutic abortion in third month. Diagnosis: mitral stenosis and insufficiency, auricular fibrillation, cerebral embolism. Postnatal examination, May 26, 1921, moderate dyspnea, slight awkwardness of left side, moderate hypertrophy of heart, with fibrillating auricle.

38. Age thirty-seven. Primipara. Admitted July 24, 1920. History of chorea and malaria. Cardiac insufficiency for six months becoming severe the last ten days. Therapeutic abortion, August 5, 1920, in the second month of pregnancy. Diagnosis: mitral stenosis and insufficiency, auricular fibrillation.

39. Age thirty-five. Gravida 2. Admitted March 25, 1920. Wassermann reaction, four plus. Moderate hypertrophy of heart with systolic murmur at base. No decompensation. Normal delivery, March 25th, at term. Postnatal examination, May 26, 1921: exertional dyspnea, edema, evidence of dilatation of the aortic arch and a systolic murmur at apex and over aortic area. Diagnosis: syphilitic aortitis. Outlook poor.

40. Age twenty-one. Primipara. Admitted March 11, 1921. Influenzal pneumonia three weeks before. Moribund on admission with extreme cardiac decompensation. Died shortly after admission. Postpartum cesarean section, child died. Diagnosis: postinfectious cardiac decompensation.

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(For discussion, see page 83)

# EFFECT OF INJECTION OF EXTRACT OF ANTERIOR LOBE OF PITUITARY GLAND UPON THE ORGANS OF GENERATION\*

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THE literature of recent years abounds with references to glands of internal secretion, and especially to the action of these glands upon the sex organs. Unfortunately, however, the contradictory findings of investigators in this field have left the subject in a state of uncertainty, so that we cannot as yet draw definite conclusions upon which to base therapeutic measures. In many instances, however, dogmatic statements bearing directly upon treatment have been made, although the experimental evidence upon which the statements are based is either incomplete or entirely unsatisfactory.

The importance of this comparatively new branch of medical research is such that every effort should be put forth to bring order into what is now unsettled and uncertain. Goetsch<sup>1</sup> from his study in this field concluded that: "All these developmental, structural, and functional changes in the sex glands of both the male and the female, produced by the feeding of pituitary extract, show an extremely selective and almost specific action of the latter upon the genital system. \* \* \* The stimulating effect upon the sex glands is greater, the longer the influence of anterior-lobe administration is exerted." Goetsch and Cushing<sup>2</sup> found that: "Pituitary extract, and particularly extract of pars anterior, has a markedly stimulating effect upon the growth and development of the reproductive glands in young rats of both sexes, as evidenced by histologic examination." Uhlenhuth,<sup>3</sup> in a series of experiments on salamanders, found that the rate of growth of the animals fed on the anterior lobe of the hypophysis was greatly increased over the rate of growth of normal animals; and that this growth did not cease after they had reached the normal "maximum" size of the species, and experimental giants were produced. However, Sisson and Broyles<sup>4</sup> learned as a result of their studies that: "Feeding of the desiccated powder of the anterior lobe of the hypophysis of calves to albino rats from three to ten weeks of age in doses of 0.04 to 0.3 of a gm. causes no change in their normal development." Winternitz<sup>5</sup> fed dried extract of this gland to a group of chicks, running a second series as controls. He found that the hypophysis-fed chicks in one series laid eggs earlier and more frequently than the controls, and that

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after six months' feeding the pituitary fed group (consisting of 11 chicks) weighed five pounds more than the controls. This effect, however, could not be duplicated later and Winternitz says: "The marked

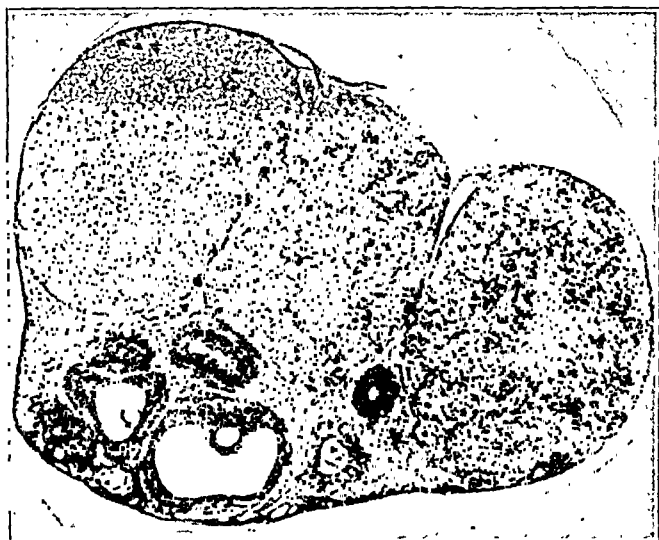


Fig. 1.—Ovary of rat, 11 weeks old, which had received daily for a period of 4 weeks subcutaneous injections of an aqueous extract of the anterior lobe of the pituitary gland.

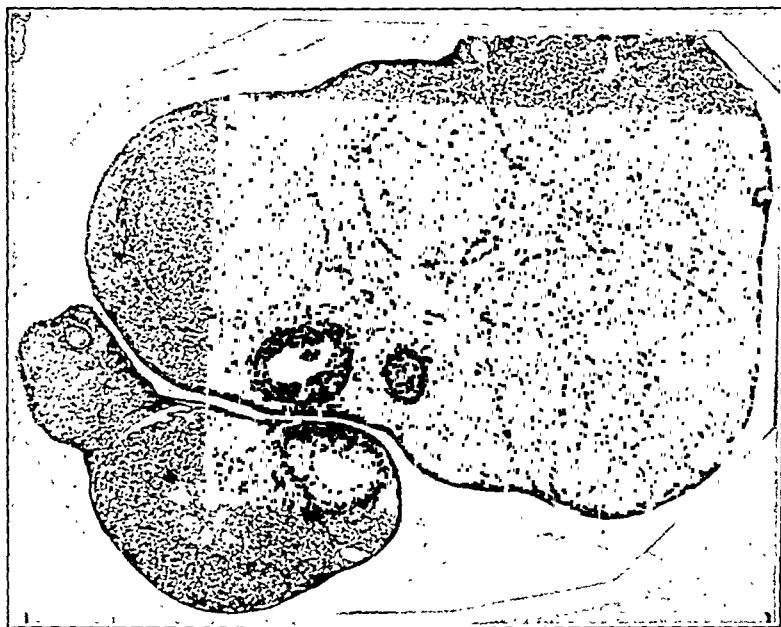


Fig. 2.—Ovary of rat, 11 weeks old, which had not received pituitary extract. Control to that shown in Fig. 1; same magnification.

changes apparently brought about by the administration of hypophysis in the first experiment is in great contrast to its inactivity in the subsequent ones, despite the fact that three separate brands of the

dried hypophysis, as well as the fresh glands, from the pig were used." Wulzen<sup>6</sup> maintained that the pituitary body, either injected or ingested, causes a diminution in rate of growth of young animals. Frank<sup>7</sup> after a most thorough and painstaking investigation concluded

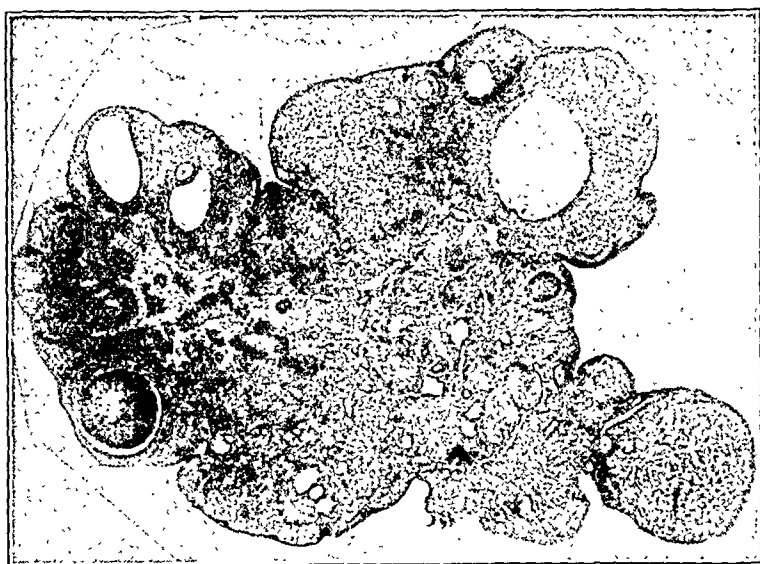


Fig. 3.—Ovary of rat, 15 weeks old, which had received daily for a period of 8 weeks subcutaneous injections of an aqueous extract of the anterior lobe of the pituitary gland.



Fig. 4.—Ovary of rat, 15 weeks old, which had not received pituitary extract. Control to that shown in Fig. 3; same magnification.

that the feeding of anterior lobe extract composed of the lipoid fraction of the pituitary gland has absolutely no effect upon the sex organs of white rats.

Many more references could be cited, but the above are sufficient to show the present status of our knowledge and its contradictions.

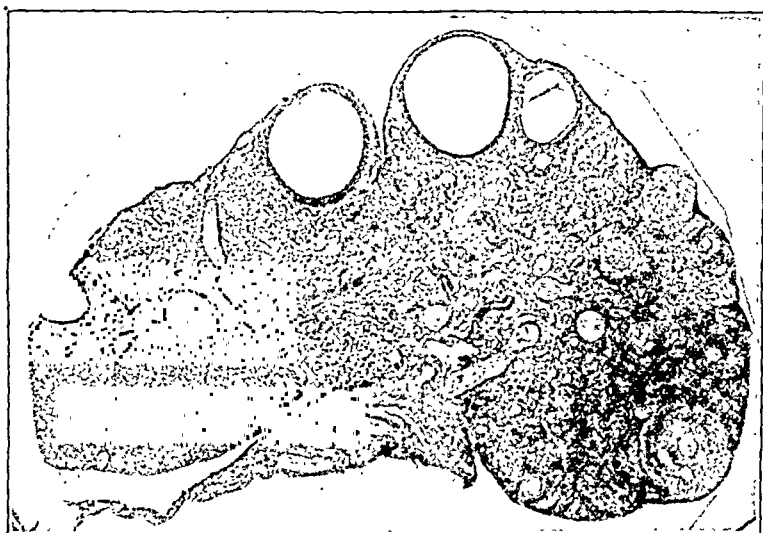


Fig. 5.—Ovary of rat, 17 weeks old, which had received daily for a period of 10 weeks subcutaneous injections of an aqueous extract of the anterior lobe of the pituitary gland.



Fig. 6.—Ovary of rat, 17 weeks old, which had not received pituitary extract. Control to that shown in Fig 5; same magnification.

In this experiment the writer undertook to study the effects of injections of anterior lobe extracts of the pituitary gland upon the organs

of generation and the general growth development of the white rat. Since feeding the extract is attended by the possibility that (1) the animal might not consume and retain the entire dose, and (2) that digestive changes might render it inert, it was decided to administer the substance hypodermically.



Fig. 7.—Ovary of rat, 22 weeks old, which had received daily for a period of 15 weeks subcutaneous injections.

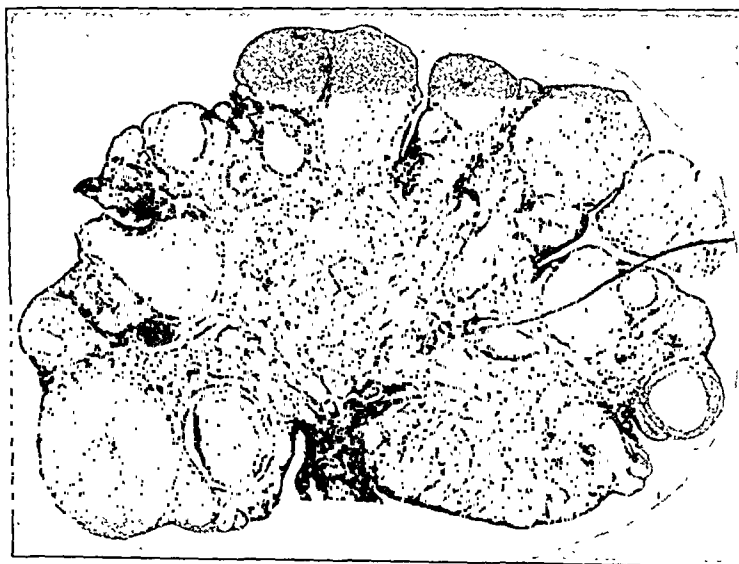


Fig. 8.—Ovary of rat, 22 weeks old, which had not received pituitary extract. Control to that shown in Fig. 7; same magnification.

Litters were bred from hardy laboratory stock of known pedigrees. Animals of the same sex in each litter were paired off. In each pair one was given the extract and the other was kept as control. Alto-



gether 52 animals were used. The material injected consisted of "antuitrin," a water-soluble solution of the anterior lobe of the hypophysis, prepared by Parke-Davis Co. The dose administered was 0.2 c.c., equivalent to 0.005 gm. of the desiccated powder. This amount was injected subcutaneously every day except Sundays. The animals were divided into three groups. The first consisted of 24 female rats—12 pairs of sisters; the second of 22 male rats—11 pairs of brothers. These two series were given the water soluble "antuitrin." A third group of 6 rats—3 pairs of sisters—was given the desiccated anterior

TABLE I

## CONTROL

TABLE II

## TEST

WEIGHT BEGINNING	END	GAIN	WEIGHT BEGINNING	END	GAIN
65	110	45	51	130	*79
63	155	92	45	104	59
66	150	84	65	145	80
58	103	45	58	95	37
34	137	103	30	122	92
65	111	46	64	96	32
62	95	33	60	86	26
80	123	43	80	88	8
78	146	68	66	125	59
66	107	41	62	95	33
80	120	40	60	101	*41
60	122	62	51	110	59
57	151	94	55	148	93
54	102	48	52	111	*59
60	78	18	58	102	*44
55	118	63	54	117	63
58	109	51	54	105	51
54	132	78	51	112	61
53	166	113	52	175	*123
50	185	135	45	190	*145
49	142	93	46	120	74
40	70	30	27	45	18
55	137	82	52	142	*90
52	190	148	44	150	116
51	121	70	49	107	58
51	90	39	31	60	29

lobe powder and was employed as an additional control. Wherever there was any difference in the weight of the animals in any pair, the larger one was used as control. The pituitary extract was administered for two weeks, the shortest period, up to fifteen weeks, the longest period. After the animals were killed, the genital organs, thyroid, hypophysis, and adrenal of each were removed and fixed in Zenker's solution, embedded in paraffin, and stained with eosin-hematoxylin. Serial sections were made of all ovaries, and while the entire uterus was not cut, large pieces, one taken from the middle of one horn and

another including the junction of both horns and their prolongations, were studied serially.

As a result of careful and detailed comparative study of organs from both the control and the test animals, the following can be said:

(1) Effect upon general growth and development. Tables I and II give the weights at the beginning and end of the experimental life period of both the control and the test animals. With few exceptions (marked with an asterisk) the pituitary-fed animals weighed not only no more, but even less than the controls.

(2) Effect upon genital tract, ovaries and uterus. In all cases the ovaries of the pituitary-fed animals showed the same or even less activity than the controls, possibly as the result of the frequent injections of foreign proteins. In none of the sections could any evidence be found to show an earlier sex maturity in the pituitary-fed animals as compared to the controls.

In view of these results, it can be stated definitely that extract of anterior pituitary lobe has no stimulating effect, either upon growth in general or upon the sexual maturity and activity of the organs of generation in the white rat.

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1145 AMSTERDAM AVENUE.

## THE PHENOLTETRACHLORPHTHALEIN TEST FOR LIVER FUNCTION IN PREGNANCY\*

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**D**URING pregnancy the normal physiological processes of the liver are augmented as a result of the greater metabolic activity of the pregnant woman, the building up of the fetal structures and the larger amount of waste material which must be detoxicated. Due to the demands of the fetus and the placenta the work of the liver in storing glycogen and in converting it into sugar is increased, for it has been shown by Slemons<sup>1</sup> that the supply of sugar to the fetus is brought about by a flow from a higher to a lower level, without any enzymatic activity on the part of the placenta, and consequently a higher level of blood sugar is necessary on the maternal side of the placental barrier. At the same time the placenta stores up glycogen as a reserve supply for the fetus. The liver regulating metabolism in general, is called upon to a great extent to detoxify the increased amounts of waste material resulting from fetal, as well as maternal, metabolism. The formation of urea from ammonia is another function of the liver which is increased during pregnancy for the same reason. The tendency to gain in weight in the pregnant woman is reflected in the fatty depots of the body, of which the liver is one. The relation of the liver to the formation of such substances in the blood as fibrinogen must be considered as being in excess of normal. Finally, the function of the liver in forming and excreting bile is probably less influenced than any of its other functions. That all these changes and increased demands throw a severe strain upon the liver of the pregnant woman is a patent fact.

Structurally the liver during pregnancy is enlarged, and is pushed upward backward and to the right by the growing uterus and its circulation thus somewhat impeded. In the liver of the pregnant woman fatty globules of varying size appear in the liver cells about the interlobular veins, this mild degree of fatty metamorphosis of the liver in pregnancy may be considered as a normal change. From this slight degree of fatty degeneration more progressive lesions may develop until an acute fatty degeneration with increase of the interlobular of fatty degeneration, accompanied by hemorrhage and thrombosis and atrophy, the picture may go on to an acute yellow atrophy. In

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the various forms of toxemias of pregnancy, resulting fatally, marked pathological lesions of the liver have been noted. In the pernicious vomiting of early pregnancy the liver has been found to be the seat of an acute fatty degeneration, with a characteristic bulls-eye necrosis about the central vein. There is a marked resemblance to the pathology of acute yellow atrophy of the liver, and to the liver seen in fatal chloroform poisoning. In toxic albuminuria the liver shows a mild degeneration, parenchymatous in type, which, however, may be severe enough to present areas of necrosis and hemorrhage. The pathology of the liver in fatal cases of eclampsia is well known. Areas of hemorrhage of varying size are found under the capsule and on cut section are seen to extend at times deeply into the liver substance. There is an extreme fatty degeneration of the parenchyma, with areas of hemorrhagic and anemic necrosis. The focal necrosis about the portal veins is probably thrombotic in origin. In some toxemic conditions, occasionally seen in late pregnancy, with or without convulsions, there may be no albuminuria or other signs of renal insufficiency. These cases are usually fatal, show a tendency to deep coma, and present such signs of hepatic derangement as jaundice, and on autopsy marked autolysis of the liver function is found. The hepatic changes found at autopsy have led some French observers to consider them as the primary lesion of the disease, and to cause a fatal impairment of the liver function. The mere fact that the liver presents a pathological condition is not sufficient evidence on which to base the supposition that the cause is hepatic, and as in no other hepatic condition do convulsions occur, it may be assumed that the pathological findings in this organ are not the cause of eclampsia.

The frequent findings of pathological conditions of the liver in the toxemias of pregnancy have led many observers to undertake studies of the functional capacity of the liver in pregnancy. Thus far no one method has been found which would give sufficient evidence of a quantitative nature to allow a determination of the degree of injury to the liver. The discovery of such a method would assist in case of lowered ability of the liver during pregnancy in determining the time at which therapeutic abortion or induction of labor should be performed, and would serve as an index of treatment. Analyses of the urine of pregnant women have been carried out to ascertain the presence of urobilin and urobilinogen. Where other causes than pregnancy could be excluded, Litzenberg<sup>2</sup> has found these substances to be present in the urines of 25 per cent of pregnant women. This suggests the possibility of a "liver of pregnancy," probably due to deficient function, caused either by congestion, or by a toxemia too mild to be recognized in any other way. Other observers have found a somewhat lower percentage of urines of pregnant women showing

these substances. Urobilinogen occurs in the urine with very mild grades of liver injury, and its finding is specific proof of liver dysfunction, as the cells of no other organ are known to have the power of transforming urobilinogen into the other bile pigments. The mildly abnormal changes in the liver in pregnancy are believed to be responsible for the slight increase in the amino-acids in the blood of pregnant women, and in the similar increase in the amino-acid nitrogen in their urines. The hemoclasia crisis test of Widal has been applied in normal pregnancy, and has shown the protopexic power of the liver to be lowered in about a third of the cases tested, but the degree of leucopenia would indicate only a mild impairment of the liver. Titus and his coworkers<sup>3</sup> have utilized the estimation of blood sugar before and after the intravenous injection of glucose as a test of the carbohydrate storage ability of the liver cells, with varying results.

The successful use of the duodenal drainage tube with estimation of phenoltetrachlorphthalein elimination in the bile by Aaron<sup>4</sup> and others, has led me to apply this test to a series of pregnant women, with a view to determine the ability of the liver to eliminate the dye, the time necessary in normal pregnancy, and the degree of delay, if any, in clinically toxemic cases. The test has been performed as follows: The duodenal tube is passed on an empty fasting stomach, with the patient in the recumbent posture. After the tube has been swallowed to the duodenal mark the patient assumes the right lateral position to favor the passage of the leaden tip through the pylorus. It was found that the tip was in the duodenum in from one-half to two hours. The position of the tip in the duodenum is determined by the failure of water to return through the tube after its oral administration, the flow of golden, yellow, alkaline duodenal contents, not reacting to dimethyl-amidoazobenzol, and the position of air bubbles forced through the tube with a small syringe. If the tube was determined by these tests to be in the duodenum the patient was given 500 c.c. of water by mouth to establish a steady drip during the test, and an intraduodenal injection of 30 c.c. was made to promote the flow of bile. As soon as a steady yellow drip was present one c.c. of a solution of phenoltetrachlorphthalein, representing 50 mg. of the dye, was injected intravenously and the time of the injection noted. The duodenal contents were then collected in a series of test tubes, two minutes drip in each tube. To each of the tubes was then added one-half c.c. of a 40 per cent solution of sodium hydroxid, and the tube shaken. The first appearance of the dye is marked by a light brownish-pink color, which is soon seen to change to an intense purplish-red color. This first maximum appearance of the dye in the tubes is considered as the end-reaction, and the time of its appearance after the injection is noted. This same

intense purplish-red color will be seen in the remainder of the tubes, of which 24 are used.

Up to the present time twenty pregnant women have been tested by this method. The results are shown in the accompanying Table I. It will be seen that the time of the end-reaction varies in apparently normal cases from 16 to 24 minutes, with an average

TABLE I

	NAME	AGE	GRAV.	MONTH	END-REACTION	BLOOD PRES.	UROBILIN IN URINE	REMARKS
1.	M. R.	16	1	9	24 minutes	110-70	0	Normal
2.	M. H.	22	2	7	24 "	112-70	0	"
3.	S. A.	16	1	7	24 "	115-65	0	"
4.	H. T.	21	1	9	22 "	115-80	0	"
5.	L. G.	17	1	9	22 "	120-70	0	"
6.	G. S.	18	1	8	18 "	120-70	0	"
7.	M. P.	18	1	7	16 "	105-60	0	"
8.	E. B.	16	1	8	24 "	110-70	0	"
9.	M. P.	18	1	6	16 "	115-70	+	"
10.	F. S.	18	1	8	20 "	150-90	0	Albuminuria
11.	M. R.	19	1	9	16 "	110-85	0	Normal
12.	M. N.	20	1	9	18 "	120-70	0	"
13.	S. B.	15	1	7	20 "	90-50	0	"
14.	B. R.	32	3	9	20 "	125-85	0	"
15.	C. C.	22	2	9	22 "	110-70	0	"
16.	M. L.	35	5	7	16 "	96-60	++	"
17.	L. P.	40	3	1 d. pp	19 "	170-100	0	Nephritis, Convulsions
18.	V. W.	22	1	9	22 "	175-116	0	Nephritis
19.	B. E.	20	1	9	25 "	150-100	0	Albuminuria
20.	M. K.	36	9	1 d. pp	28 "	170-110	0	Albuminuria

of 20 minutes. In the cases of a clinically pathologic nature the end-reaction was variable. In one case where albuminuria and a high blood pressure were present throughout the pregnancy, and convulsions developed at the seventh month the end-reaction was reached in only 19 minutes. In this case the elimination of phenolsulphonephthalein in a three hour test was 10 per cent, 5 per cent, 3 per cent. In another case of albuminuria and a high blood pressure, with premature delivery of twins at the sixth month, following vigorous eliminative treatment, the elimination of the dye was delayed to 28 minutes.

## SUMMARY

The functional activities of the liver are under a greater strain in the pregnant than in the nonpregnant state. The liver, under this augmentation of its functional capacity, undergoes a mild degree of fatty degeneration in normal pregnancy, which condition increases at times, under the various morbid conditions peculiar to pregnancy, to extreme degrees of degeneration, necrosis, hemorrhage and autolysis. The degenerations of the liver are probably secondary to the causes of the toxemias, and may be largely due to an exhaustion of its

glycogenic ability. The various tests for determining the functional ability of the liver in pregnancy are not sufficiently valuable from a quantitative standpoint. The phenoltetrachlorophthalein duodenal elimination time test has been performed on a number of normally pregnant women, with fairly constant end-reactions, and in several pathologic cases, with variable results where liver damage might reasonably be suspected to be present. Further studies will be necessary to properly evaluate this procedure.

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262 SOUTH TWENTY-FIRST STREET.

## UTERINE POLYPS—HISTOLOGY, SYMPTOMATOLOGY AND A SUGGESTION AS TO ETIOLOGY\*

BY SAMUEL H. GEIST, M.D., F.A.C.S., NEW YORK, N. Y.

UNDER the term uterine polyp is grouped a variety of lesions. They may exist as localized mucosal hypertrophies of polypoid structure, or may be definite tumor masses attached to the uterine or cervical wall by long thin or short thick pedicles, and covered by mucous membrane. They may project into the cavity of the fundus or cervix, protrude from the external os into the vagina, and in some instances, may even present in or project through the vulvar orifice.

There is however a great variation in the constituents of the polyps. They may be classified as adenomatous, fibromatous, fibromyomatous and angiomatous tumors. Under these types are found many variations in the histological elements composing the polyps.

Grossly, the form varies. In the body of the uterus, the adenomatous polyps are flat or rounded masses sometimes oval or lobulated. They are seldom larger than a walnut, though rarely they may grow to the size of a hen's egg. They are usually multiple, and occasionally may cover the entire endometrial cavity. It seems as if they have a predilection for the cornua of the uterus. These adenomatous polyps may become cystic, due to occlusion of the ducts and distention of the glands, and often the surface in this type may be pitted or irregular because of the rupture of the superficial cysts.

The adenomatous polyps may be sessile or pedunculated. The pedicle is usually short, not more than one-half of an inch, and usually rather slender. Rarely it may be elongated and the polyps project from the cervix. These growths whether they are pedunculated

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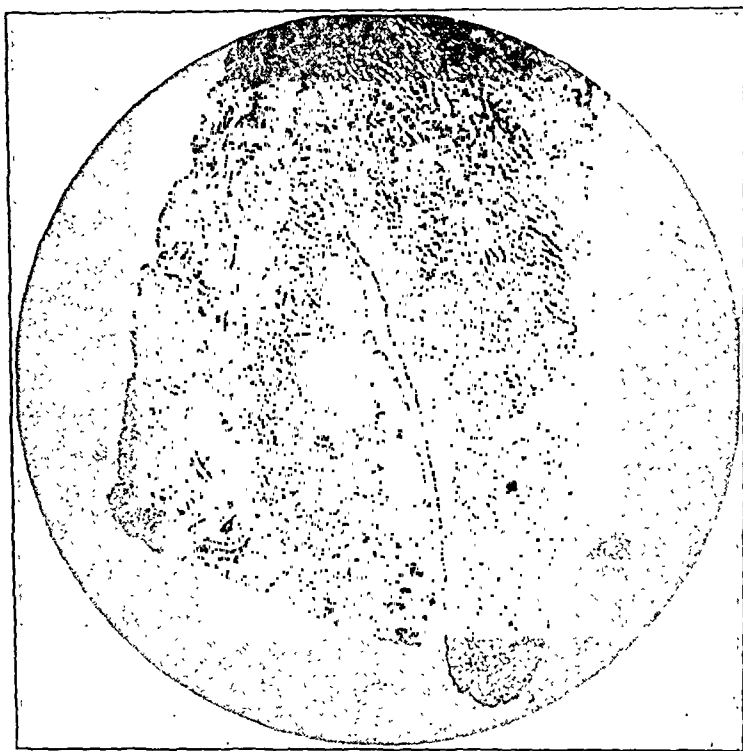


Fig. 1.—Fundal adenomatous polyp showing similarity in structure to the normal uterine mucosa.

Edema of stroma and dilatation of glands near tip.

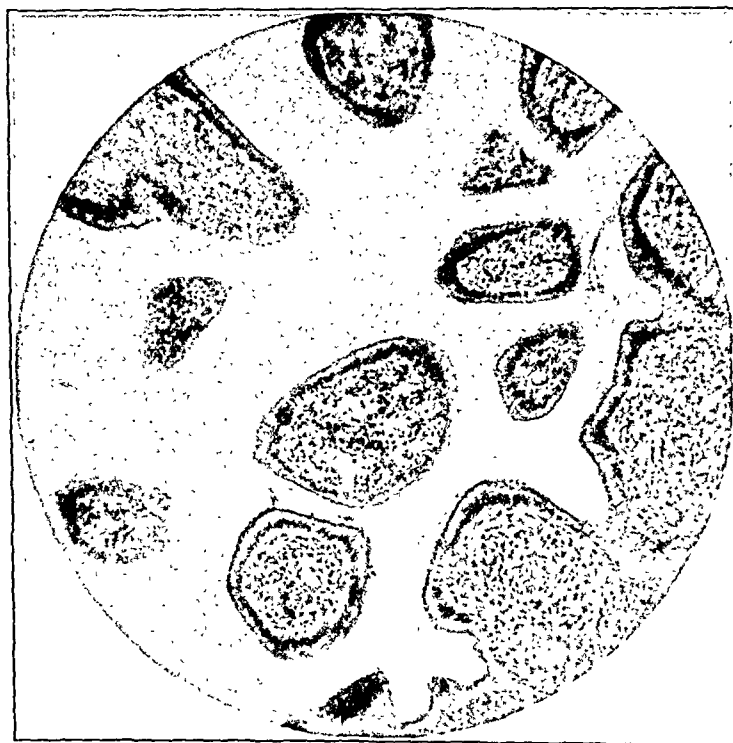


Fig. 2.—Papillary projections of polyp cut across showing round cells infiltrating a connective tissue core containing blood and lymph vessels and covered by high cylindrical (cervical epithelium).



or sessile merge into the surrounding mucosa without a distinct line of demarcation, and seem to be a part of the mucosa proper. (Fig. 1.) These masses are soft, velvety and occasionally show hemorrhagic infiltration in the tip, especially in the pedunculated variety.

In the cervix, the adenomatous type is rather common, in fact, there is a marked tendency for the cervical mucosa to form polyps especially in the presence of an inflammatory process. Here they are almost always pedunculated. In the cervix they may also be multiple. They are smaller, harder than in the corpus type, and due to the proximity to the external os, and to the tendency to form long thin pedicles, commonly project into the vagina. They are often cystic, the cysts being large and containing a thick mucinous fluid in contradistinction to the corpus polyps, which when cystic, are made up of tiny cysts containing a thin serous fluid. In some instances a nabothian follicle may be extruded and in the process present as a pedunculated cyst, i.e., a polyp. The cervical polyps are occasionally papillary, (Fig. 2), and the surface may show lacunae due to the rupture of the cysts, as is also true of the corporeal ones. Those polyps that project through the external os are almost invariably hemorrhagic due to interference with the thin-walled venous channels. Those that present in the vagina, even when not hemorrhagic, have a bright red velvety appearance, like the normal cervical mucosa.

The fibromatous or fibromyomatous polyps are really intramural fibromata or fibromyomata that are gradually extruded into the cavity of the uterus or cervix. They are hard, rounded tumor masses and vary in size from a bean to an orange. Depending on the stage of the extrusion they are either broadly sessile or pedunculated. The pedicles are firm thick strands, in contradistinction to the pedicles of the adenomatous ones, which are very soft. These tumors are often hemorrhagic and edematous with an eroded, ulcerated or necrotic surface due to the damage to the blood supply, which in this group is very poor and easily interfered with.

Histologically, the adenomatous polyps resemble the mucous membrane from which they arise. The gland content varies. In some instances the glands are extremely numerous with very little stroma while in others they are very scanty in number and show a corresponding increase in the stroma. The glands may be regular or irregular showing marked tortuosity, (Fig. 3), a racemose tendency, or they may be large, dilated, distended glands, cystic in character. This latter type is most common in the cervical polyps.

The epithelium covering the polyps and lining the glands shows variations in type. In the fundal type the cells are often high with granular cytoplasm and a small oval, or round, basally placed, pale staining nucleus. Occasionally in these fundal polyps ciliated cells are found on

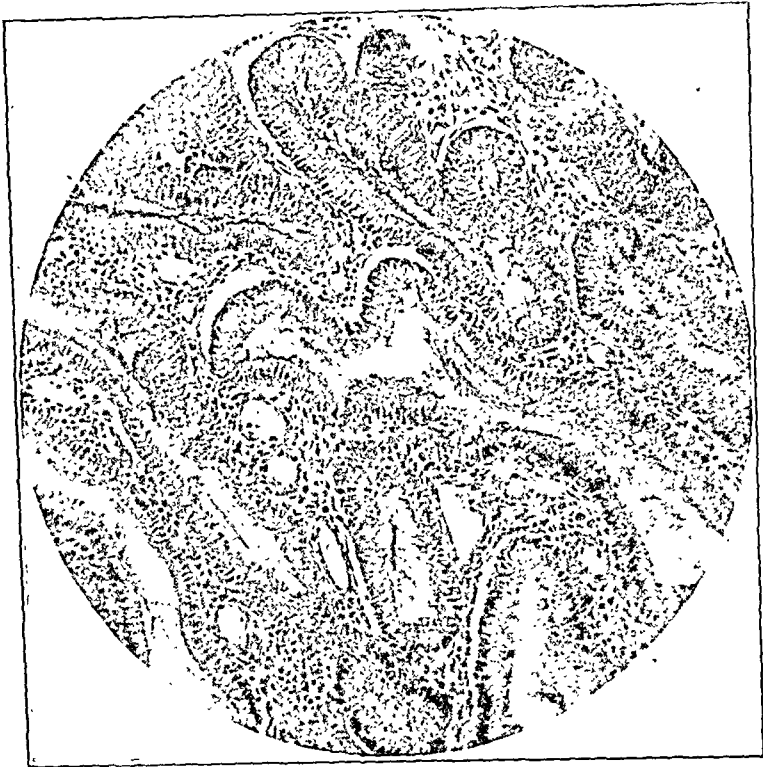


Fig. 3.—Markedly irregular tortuous glands with high cylindrical epithelium. *Not malignant.*



Fig. 4.—Section of polyp showing metaplasia with squamous epithelium extending into the glands. *Not malignant.* Uneventful postoperative course extending over a period of three years.

the surface epithelium. In the glands one may find multiple cell layers or rather a heaping of cells, of the same general character as the rest of the polyp, and with no suggestion of malignancy. One may also find areas of atypical cells consisting of two or three irregular rows. These cells may be of transitional type with a few high cylindrical cells on the surface and a more cuboidal type deeper in. These cell variations are not malignant but may be a point of origin for a possible malignant change. Occasionally there is a marked metaplasia in smaller or larger areas with typical stratified squamous epithelium. (Fig. 4.) This is especially true in the case of polypi projecting through the external os. Often these extruding polypi present papillary pro-

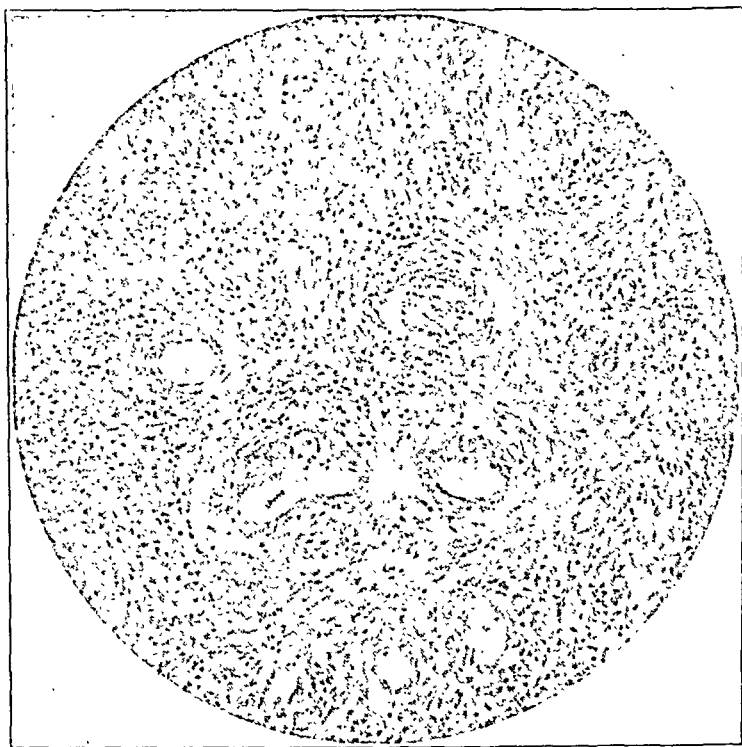


Fig. 5.—Numerous thin wall vessels in a cervical polyp.

jections (Fig. 2) composed of a fibrous tissue core containing small lymph and blood vessels covered by epithelium either stratified, transitional, cuboidal or cylindrical. The gland epithelium, too, may take part in these metamorphoses.

In the cervix the epithelium of the polyp is usually of cervical type, high cylindrical with a pale granular protoplasm and a basal oval nucleus. These cells resemble the typical mucin producing cells of the normal cervix, and the cysts which form more often than in the fundal type, contain a thick tenacious mucin. These cells, too, may present all the atypical variations mentioned above, as found in the

fundal polypi. The glands in the cervical polypi show a more marked tendency to become irregular and tortuous and the epithelium undergoes metaplasia more commonly than in the fundal types. It is essential to remember that many atypical variations can take place in the type of epithelium and in the character of the gland, without a true malignancy developing. The metaplastic areas may involve large areas of the polyp, the mass of glands may be tortuous and still the growth is benign. Mitoses are not numerous. Here, too, these areas may form a starting point for a malignant change, but infiltration into the surrounding tissue is essential for a definite diagnosis of malignancy. The metaplastic epithelium may extend under the more normal surface epithelium or even into the glands (Fig. 4), thus mimicking a true carcinoma. These metaplastic areas either on the surface or in the glands may be the starting point for a malignant growth.

The fibromatous or fibromyomatous polyps are really fibromata or fibromyomata, i.e., true tumors that are being extruded by the muscular contractions of the uterus. As they are forced into the cavity of the uterus they push before them the mucosa which then acts as a covering layer. As they extend into the cavity they lose their sessile character and become pedunculated. They are true tumors made up of pure fibrous tissue or fibrous and smooth muscle tissue. Occasionally one finds islands of tissue resembling the mucosa of the fundus scattered in the substance of the fibroid. The glands in these islands may be dilated and often contain old blood. Such a tumor is really an adenomyoma that has become pedunculated and is being expelled. The mucosa covering these tumors corresponds to the type that lines the cavity into which the tumor originally projected, i.e., either fundal or cervical. The pressure often, however, causes marked atrophy and one finds instead of a distinctive epithelial covering simply a layer of low cuboidal epithelium. In some instances even this disappears and there can be distinguished just a fibrous tissue layer and no epithelium. Often the surface is eroded and necrotic for the reason previously mentioned.

The stroma of the polyp resembles, as do the epithelial elements, the tissue of origin. In the fundal types it is cellular, made up of small round cells, with occasional lymphocytes or plasma cells and usually shows infiltration with leukocytes, of a chronic inflammatory nature. There are both lymph and blood vessels in the stroma, the latter being much more numerous (Fig. 5). These vessels are often dilated, thin wall sinuses, or sometimes rather thick walled veins and arterioles. Occasionally they rupture, especially in those polyps that protrude through the os, and thus produce a hemorrhagic blood infiltrated mass which may result in external hemorrhage. At times the vessels are so

numerous that the tumors are classified as telangiectatic polyps (Fig. 5) and may even resemble erectile tissue, when there is smooth muscle also present.

In the cervix the stroma is more fibrous in nature with areas of smooth muscle, inflammatory cells and vessels. Here especially is the richness in blood vessels marked, and in this type mechanical injury, torsion of the pedicle, or possibly the normal menstrual stimulation, may cause bleeding.

The pedicles of these protrusions may be short and thick or long and thin. The constituents are similar to those formed in the main mass, namely mucosa, either of cervical or fundal type, covering a mass of connective tissue, muscle tissue, vessels and glands, with usually a moderate inflammatory infiltration. At times, however, the pedicle may be so attenuated that it is represented by only a few fibrous connective tissue strands covered by an atrophic thinned out mucosa.

In the pedunculated fibromata or fibromyomata the pedicle is usually fairly thick and consists mainly of muscle, connective tissue, and blood vessels. In these tumors the pedicles may also elongate to an extreme degree and be represented by a few muscle or connective tissue strands covered by mucosa, and the tumor project through the cervix, where it may become infected, ulcerated, gangrenous or necrotic, due to twisting of the pedicle; or it may even slough off and lie free in the vagina.

The malignant changes that may take place in a polyp are of two kinds, either carcinomatous or sarcomatous. These are rare conditions but do occasionally occur. One must, however, distinguish the metaplasia that is fairly frequent, especially in polyps that project into the vagina, from a true malignancy. Metaplastic epithelium, in the form of squamous cells that may extend into the glands or under the superficial epithelium, must be distinguished from true malignancy with infiltration of the base of the tumor, and extension into the adjacent tissue, combined with other signs of malignancy, such as atypical cells, large deeply staining irregular nuclei and mitoses. Carcinoma may arise either from the surface epithelium or from the glandular epithelium and thus give origin to either a squamous cell carcinoma or an adenocarcinoma.

Sarcomatous change is much less frequent than the occasional carcinoma and may arise from any of the connective tissue structures in the growth. These changes are more frequent in the fibromatous or fibromyomatous polyps.

Symptomatically these polyps may not make themselves known. Many autopsies show uteri full of polyps both adenomatous or fibromyomatous, that give rise to no symptoms during life. The commonest

symptom, or rather associated condition, however, is bleeding. This symptom may take the form of a *menorrhagia* or *metrorrhagia*. At times it may be quite profuse, sufficient to cause a marked grade of anemia. The mechanism of this symptom is not easy to explain in all cases. It cannot be due to the presence of the polyp alone, for in many cases these tumors are associated with no symptoms and are purely accidental findings at autopsy.

In some of the cases associated with *metrorrhagia* the hemorrhage is due to an erosion of the tumor surface and so an injury to the vessels, or to a torsion of the pedicle and consequent rupture of the vessels. In almost all instances the tumors in these cases are long pedunculated ones that can be felt in the cervix or projecting through it. In other words, mechanical injury to the tumor surface or vessel, is the important factor.

In the group associated with *menorrhagia* there must be another explanation. Here the type of polyp is not the projecting long pedicled fibromatous or fibromyomatous tumor, but the small adenomatous type found in the fundus. Here, too, the mere presence of the abnormality cannot account for the bleeding as similar protrusions may occur with no symptoms. Also, the polyps are present between the periods and yet no bleeding occurs. It would then seem that the normal menstrual function is exaggerated in some of the cases associated with adenomatous polyps, and because of the rather frequent association it might be suggested that the two conditions, the adenomatous polyp and the bleeding, have a related etiology, possibly endocrine in origin.

Occasionally when a protruding polyp becomes infected there may be a foul purulent vaginal discharge present and if there is any absorption from an infected surface or tumor this may be indicated by a septic temperature. There is sometimes a *history* of dysmenorrhea, due possibly to the increased uterine contraction stimulated by the presence of the foreign body, and often there is a history of excruciating uterine pain when a tumor is being extruded.

On physical examination in the ordinary fundal type one can determine very little. Occasionally the uterus feels slightly enlarged and somewhat asymmetrical. With the pedunculated and extruding variety the examining fingers will detect a smaller or larger tumor, depending on the type, and of a consistency determined by the histology as mentioned above. Sometimes the small protrusions of adenomatous type are so soft that they are overlooked or rather not identified by the gloved finger, but the speculum demonstrates them as bright red, often very friable, vascular, protrusions. The ulcerated or necrotic ones present as inflamed reddish tumors, with a fibrinous or purulent

exudate covering part of the surface, and easily injured by the finger or an instrument, with resultant bleeding.

The question of the etiology of the polyps is a rather important one. It is true that in some instances inflammatory lesions may give rise to polypoid outgrowths of the mucosa, as for example the nasal polyp due to sinus disease. In cervical infections of long duration there is occasionally a hypertrophic condition of the mucosa, but in no instance does the hypertrophy take on the magnitude of the typical, so-called mucosal polyp. These inflammatory hypertrophies are circumscribed small masses varying from a pea to a bean in size. Another differential point is the presence of edema and marked inflammatory infiltration in the small hypertrophies associated with a chronic endocervicitis, and while areas of inflammatory cells are found in the real polyps they are by no means the predominating picture. Again the polyps are very common in the uterus and, as we know, real chronic endometritis is a rather rare condition. From these facts it seems rational to conclude that inflammation can only play a minor rôle in the causation of the mucosal polyps so commonly found.

There are several factors that would indicate that the polyps are simply local exuberant growths of the mucosa, especially those in the fundus, and that the etiological factor may be found not in the uterus but in some other organ, or as a disturbance of some normal physiologic function.

The hypertrophies partake of the histologic characteristics of the parent tissue (Fig. 1). There is no distinct line of demarkation from the surrounding tissue when examined microscopically (Fig. 1). The mucosa of the uterus merges directly into that of the polyp, streams in as it were, and the two tissues are almost identical in structure. True, there is a greater tendency to the formation of cystic glands, but that I believe is due to a mechanical interference with the emptying of the glands, especially those situated near the tip of the polyp. Again, the stage of the gland cycle in the polyp is the same as that of the mucosa of the uterus, and in those cases associated with bleeding, the histological picture is that of the hypertrophied mucosa that is so characteristic in cases of essential uterine hemorrhage or in the hemorrhages accompanying fibroids.

It seems that the so-called adenomatous polyps of the fundus are really not true tumors, but the products of some stimulation (endocrine). They only give rise to symptoms when there is real mechanical injury to them, except in those cases when the cause of the polyp, and not the polyp itself, gives rise to other symptoms, as hemorrhage. These polyps should not be classified as tumors.

In the cervix the same causative factor may be at work, but here inflammatory processes may give rise to polypoid mucosa hypertrophies

resembling the process in the nasal mucosa. The real tumors termed polyps, are more accurately described as pedunculated fibromata or fibromyomata, and symptoms associated with them are due to mechanical injury or to other extraneous factors.

We thus feel that we have to do with distinct processes included under the term uterine polyps, namely, real pedunculated tumors such as the fibromatous and fibromyomatous neoplasms, inflammatory mucosal reactions as seen in the cervix, and the localized mucosal hypertrophies so commonly found in the fundus. These latter are either associated with fibroids, with essential uterine hemorrhage, or exist as distinct entities without giving rise to any definite symptoms.

The one symptom most commonly associated with them is hemorrhage and, except for those instances of localized injury to the vascular channels, it would seem that the metro- or menorrhagia must have a factor other than the mucosal hypertrophy that determines it.

We believe after careful histological examination of those cases associated with atypical bleeding, that no lesion can be found to account for the hemorrhage except in the minority of cases and that the cause for this symptom is some factor not present in the tumor proper. As I have mentioned in previous publication, dealing with hemorrhage associated with fibroids, so-called essential uterine hemorrhage, and hemorrhage associated with ovarian and tubal tumors, the endocrine glands are most likely the important factor. Removing the ovaries by operation, x-ray or radium will cause these mucosal hypertrophies to atrophy or disappear, and will cure the associated bleeding. Because of this we must give consideration to the ovary as the factor of importance in the etiology of the symptom of hemorrhage, and probably for the presence of the hypertrophy. True, no histological lesion in the ovary can at the present time be demonstrated, but the disturbance is probably one of the normal physiology, that at least up to the present, cannot be determined. Again, the abnormal function of the ovary in itself may not be, and probably is not, the entire factor. The other glands of the known endocrine chain, and even the mucosa of the uterus, may by a perversion of their physiological functions act as important factors in the production of the pathological lesion in the mucosa, and of the abnormal bleeding.

I wish to thank Dr. J. Brettauer and Dr. F. S. Mandlebaum for the privilege of studying the pathologic material and the use of the clinical data. I am indebted to Dr. J. Globus for the photomicrographs.

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## SYPHILIS IN RELATION TO ABORTION, STILLBIRTHS AND INFANT MORTALITY\*

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THIS paper is based on statistics obtained from the obstetrical and gynecological service of Professor B. P. Watson, in the Toronto General Hospital. Since February 1, 1918, Wassermann tests were performed on 1674 mothers at the time of delivery—of which number 73, or 4.3 per cent reacted positively.† These figures correspond very closely with those obtained in clinics elsewhere, allowing always for the presence of a negro population in certain of them.

No attempt will be made to pass judgment or to theorize upon the inconstancies of the Wassermann reaction. To look to the literature for light is only to be more confused, because of the diversity of opinions. It therefore has been taken as our method of diagnosis, fully realizing its shortcomings.

It is well known that certain fevers, such as pneumonia, and intoxications such as puerperal fever and eclampsia, as well as anesthesia often upset the reaction. Also, in the latter months of pregnancy the reaction is occasionally falsely positive.

Menten<sup>1</sup> among others, has shown that a positive reaction before parturition will often become negative shortly after delivery. In the series described the Wassermann was found in six cases to be negative on repetition after delivery, having been positive previously—the baby in each case being healthy and showing a negative test. Two of these women returned with second pregnancies and gave negative reactions. The babies again were healthy and their Wassermans were negative. We have taken all six therefore, as examples of an upset due to pregnancy and classed these patients as nonsyphilitic.

Granting that with the above mentioned exceptions we are dealing with syphilitic women in the cases reacting positively, let us consider how great a factor is syphilis as a cause of stillbirth and infant mor-

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\*Read before the Academy of Medicine, Toronto, January 5, 1922.

†These tests were made in the Serological Laboratory under the direction of Dr. H. K. Detweiler of the Department of Medicine, University of Toronto.

tality. Williams at Johns Hopkins, in a series of 10,000 cases records 705 deaths of children and estimates syphilis as the cause of 32 per cent of this total. Routh, after a lengthy review of vital statistics concludes that 20 per cent of the stillbirths and abortions occurring in England are due to syphilis and this, if correct, would represent a loss of 27,000 potential lives in England and Wales annually.

Deducting the six cases previously referred to, we have in our series, 67 women with definitely positive reactions. These women gave birth to 53 living babies and 14 stillbirths; approximately one stillbirth to every four living children.

Now before we follow the subsequent history of these children, may we consider for a moment the question of the fetal or cord Wassermann test? This is taken as a routine. As a diagnostic measure it is universally agreed that this is far from satisfactory and held by some to be so unreliable as not to be worth the time and expense entailed. Nevertheless, it does seem to portend to a certain degree the future of the newborn as the following figures show.

Fifty-three children were born to mothers with definitely positive reactions. Of these 28 gave positive cord Wassermann reactions, 21 were negative and in four the tests were not categorized. In two of these four the samples of blood were unfit for use and in the other two there was incomplete fixation.

Of the twenty-eight positive children 10 are still alive, that is at ages varying from a few months to between two and three years. Ten have died and eight have been lost to our records.

Of the twenty-one children with negative reactions thirteen are living, one has died and seven are off our records.

One of the four in which the reaction was indefinite is known to be alive, the other three we cannot trace.

Unfortunately, our "follow-up" system has in the past lacked proper organization and this accounts for the deficiencies in this report.

One case of interest is added to the above. The maternal Wassermann was negative, while the child, which died shortly after birth, gave a positive reaction.

The old law of Colles is familiar enough; namely, that a normal mother may give birth to a syphilitic child and yet remain immune to infection from it. This, of necessity, would indicate a direct paternal infection. Whether or not this explains this incongruous finding or whether the answer is that it is a result of a latent form of maternal syphilis, I cannot say. The question of the mode of infection of the ovum is still an open one.

There is a firmly established belief, which, however, of late has been questioned and seems to be disproved, namely, that syphilis is the most frequent cause of abortion or the termination of pregnancy in the earlier months.

The following are the figures obtained from a review of the cases of abortion in the Toronto General Hospital.

In 292 cases only 11 gave a positive Wassermann reaction, the remainder were negative, which is only 3.8 per cent specific.

A perusal of the records is rather illuminating in that we see 281 nonsyphilitic women having 1203 pregnancies showing a termination by abortion on 527 occasions; this is the appalling percentage of 43 per cent. It would seem, that the termination of pregnancy by unnatural means threatens the national birth rate to a far greater degree than we would ordinarily care to believe. Also, it is of interest to note that, the only three women giving a history of five or more abortions were all nonsyphilitic.

Adair<sup>3</sup> came to a similar conclusion with regard to the relationship between syphilis and abortion.

TABLE I  
ABORTIONS

	NO.	%	AV. AGE	PREGNAN- CIES	ABOR- TIONS	% OF ABOR- TIONS	PARA ONE	MAR- RIED	5 OR MORE ABORTIONS
Syphilitic	11	3.8	28	44	15	34	1	2	0
Nonsyphilitic	281	96.2	29	1203	527	43	53	50	3
Total	292								

To return to the question of stillbirths, it may be stated that in 135 stillbirths, 14 occurred in mothers with positive Wassermann reactions.

Placenta previa and difficult labor are reported causes, both showing slightly higher figures than this and a much larger number of stillbirths occurred with no recorded cause, principally during the influenza epidemic of 1918.

This does not agree with the findings of other investigators, who would show syphilis as a far greater causal factor. For example, certain of the Continental workers would class 95 per cent of the macerated fetuses as syphilitic in origin. Our figures in no way approximate this.

To summarize our findings: In fifty pregnancies in syphilitic mothers, there were fourteen stillbirths and twelve deaths of the infant, yielding a birth rate loss of slightly over 50 per cent.

TABLE II  
INFANT MORTALITY

	LIVING	DIED	NO RECORD
Mother positive—, baby positive at birth	10	10	8
Mother negative—, baby positive at birth	—	1	0
Mother positive—, baby negative at birth	13-x	1	7
Mother positive—, baby (?) at birth	1	—	3
	24	12	18

“x” Includes one baby who developed positive Wassermann which became negative on treating.

Note—Percentage of deaths 33⅓. Percentage of deaths with baby having positive Wasserman 54. The addition of 14 stillbirths shows a total infant mortality 52 per cent.

The masterful record of J. Whitridge Williams<sup>4</sup> lays great stress on the value of the correlation of the Wassermann reaction, the routine examination of placentae and the thorough postmortem examination of the fetus.

Some attempt has been made in our Department to study the placenta, but with little success; and the immensity of the work by a small staff is evident.

I have been able to find records of nine autopsies bearing on the question in point. Five stillborn fetuses were autopsied. In all these cases the maternal Wassermans had been positive. In three the findings at autopsy were positive for syphilis. In one case the mother died of eclampsia. She had a positive Wassermann and it is now impossible to say whether this was due to her toxemia or an evidence of syphilis. The child in this case showed no evidence of syphilis, but in the liver, findings similar to the changes of eclampsia were present.

In four children autopsied the maternal Wassermann had been positive in three. The autopsy findings were positive in two. The other child had been born of a mother who had been under treatment for syphilis; her Wassermann was negative at the time of the birth and in this case the child showed no evidence of syphilis.

There are thirteen cases to report in which the mother had been treated previous to delivery. In seven of these the maternal Wassermann was still strongly positive at the time of birth. These mothers gave birth to six living children and one stillbirth. Three children died shortly after birth with very strongly positive reactions and three children survive, one of whom has a positive Wassermann and is under treatment. Three mothers gave weak positive reactions and their children are all living and apparently healthy. Three mothers gave negative Wassermann reactions. Two of the children from these mothers are alive and apparently healthy, the third child died a few

days after birth. At autopsy no evidence of syphilis was found. The same patient gave a history of two children who had previously died shortly after birth.

The following case is of interest. The mother gave a positive reaction. The baby gave a negative Wassermann reaction, becoming positive shortly after birth. Treatment was commenced and the baby is alive and apparently healthy. The mother, however, after two years' treatment still gave a positive reaction and upon becoming pregnant, gave birth to a stillborn baby.

In drawing our conclusions it is obvious that we cannot be dogmatic, but the following points may be made:

1. Mechanical interference is the most important factor in abortion as seen in a gynecological clinic.

2. That the relative importance of syphilis as a factor in the destruction of life increases with the period of the development of the pregnancy.

3. That even if the Wassermann reaction is not infallible it is a most valuable guide both to diagnosis and to prognosis.

4. The difficulty experienced in collecting the statistics of the small series reported only emphasizes the well-known need for close cooperation between the various departments and an efficient "follow-up" system.

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## HYDATIFORM MOLE, WITH REPORT OF TEN CASES\*

BY GEO. L. BRODHEAD, M.D., AND FRED. A. KASSEBOHM, M.D.,  
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THE rare occurrence of hydatiform mole is evident from the reports of recognized authorities. Edgar has seen it four times in 15,000 cases of labor observed in hospital and private practice and states that the condition tends to recur. He also quotes Mayer as reporting eleven recurrences in one patient. Pozzi (1909) stated that he had never seen an hydatid mole in over 6000 cases of labor observed in his hospital and private practice and Madame Boivin saw it once in 20,000 cases; Mayer (1911) reported one case in 310 and Donskoj (1911) stated that the incidence of hydatid mole at the Frauenklinik at Munich over a period of sixteen years was only one for every 4058 births. At the Harlem Hospital on our service we have seen six cases in 12,030 cases of labor and abortion, or about one in 2000, covering a period of eight years from January 1, 1914, to November 30, 1921. In addition to our six cases from the Harlem Hospital service we are able to add the reports of four cases, for three of which we are indebted to Dr. E. G. Langrock of this city, one being a private case of Dr. G. L. Brodhead.

### PATHOLOGY

The nature of an hydatid mole has been the subject of much controversy; Virchow taught that they were simply myxomatous hypertrophied chorionic villi. Arthur W. Meyer in 1918 mentioned the importance of the work of Gierse published after his death by Meckle in 1847; Gierse claimed that definite transitional forms could be traced between the slightest change in the caliber of the villi and the most marked hydatid change. He described a villus showing hydatid degeneration from a chorionic vesicle about 12 mm. in size with the largest hydatid one-third of a line large; and further stated that such pathological changes are present in many abortions and seem to be the most frequent cause of abortion in the early weeks of pregnancy. While the work of Gierse has been either overlooked or disregarded by numerous writers and investigators and did not receive general recognition, his findings have been confirmed by Meyer's work at the Carnegie Institution in Washington.

Regarding the formation of chorioepithelioma following hydatid mole, quite a difference of opinion exists. Findley says that 16 per

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\*Read at a meeting of the Medical Association of the Greater City of New York, December 19, 1921.

cent of hydatid moles are followed by malignancy; Teacher believes that less than 5 per cent develop malignancy. DeLee states that chorioepithelioma (chorioma syncytioma malignum) gives a previous history of hydatid mole in about 50 per cent of cases, but he has had sixteen cases of mole none of which have developed metastases, nor have 75 others reported by König, Giglio and Kehrer. DeLee further states that the entire chorion may be changed or only a portion, leaving part of the placenta intact; pathologists, however, are not certain whether degeneration precedes the death of the fetus or follows it; probably both. Wood states that there are cases on record where a long period of latency (5 years) intervened between pregnancy and tumor formation.

#### INCIDENCE

In our ten cases three occurred between 20-25 years, three between 26-30; one between 31-35; two between 36-40; one between 41-45. The average age of these cases is 30.4 years, agreeing with the six cases of Poten with an average age of 32 years, ten of Donskoj at 25 years, twenty-three of Briggs at 28 years, six of Gromazki at 29.6 years and eight of Robertson at 28.4 years; also confirming the findings of Williamson who denied that hydatiform mole was especially common near the menopause.

#### PARITY

Three cases occurred in primiparae and seven in multiparae.

#### RACE

It is rather curious to observe that on a service which is composed of a greater proportion of negroes, that all of our six hospital cases occurred in white patients.

#### PERIOD OF GESTATION

One woman was two months pregnant; one, three months; four, four months; two, five months; one, five and one-half months; and one seven months. These statistics coincide with Meyer's statement that hydatiform degeneration is a common disease in the early weeks of pregnancy, being less frequent as term is approached.

#### APPARENT SIZE OF UTERUS

The patient who was pregnant two months showed an apparent size of two months, and the patient pregnant three months showed an apparent size of that period. The four women having a four months' period of gestation showed an apparent size of six months for two

cases, six and one-half months for the third case and seven and one-half months for the fourth case. Two women having a five months' period of gestation showed an apparent size of three months for one and five months for the other. Another patient five and one-half months pregnant showed an apparent size of three and one-half months while one who was seven months pregnant showed an apparent size of five months. This would tend to bear out the contention of Briggs that uterine enlargement in hydatiform mole is frequently not beyond the normal, which is contrary to the general belief.

#### WEIGHT OF MOLES

Unfortunately we were able to secure the weight of but five of our specimens, the largest of which weighed 1050 grams. This mole was extracted from a patient 40 years of age, a six para, period of gestation four months but with a uterus that had an apparent size of from seven and one-half to eight months. The red blood count after the manual extraction of the mole was 1,568,000, hemoglobin 30 per cent, and 900 c.c. of blood was given intravenously by the Unger method; two days later the red blood count was 2,240,000, hemoglobin 40 per cent; four days after this her hemoglobin had gone down to 30 per cent again and her red blood count to 2,096,000. The patient again received 800 c.c. of blood by transfusion; on the fourth day following this last transfusion her red blood count was 3,972,000, hemoglobin 65 per cent and she made an uneventful recovery. This patient has gained thirty pounds since she left the hospital in May, 1921. The other four moles weighed 896, 608, 384 and 256 grams, respectively.

#### TEMPERATURES BEFORE OPERATION

The temperatures before the delivery of the moles were as follows: Five patients had a normal temperature on admission and before delivery; one patient had a temperature ranging from 98.6° F. to 101° F. for two days before the extraction of the mole; one had a temperature of 100° F.; one had a 100.4° F.; one had 102° F.; and another had a temperature of 102.4° F. on admission, which rose to 104.4° F. before removal of the mole.

#### TEMPERATURES AFTER OPERATION

Three patients had a normal temperature after the extraction of the mole. Five patients had temperatures ranging from 101° F. to 103.4° F. for 24 to 72 hours after operation, returning to normal thereafter. One patient had a chill and temperature of 104.8° F. two hours after the extraction of the mole, becoming normal the following day. One patient, septic on admission, ran a temperature fluctuating between 102° F. to 104° F. for three weeks and then became normal.



## URINARY EXAMINATIONS

The urine was examined in five of our ten cases. In four were revealed evidences of a nephritis, showing large amounts of albumin and many hyaline and granular casts; the other case showed a practically normal urine.

## FETUS

DeLee (1918) states that ordinarily all traces of a fetus have disappeared but there are cases on record where a fetus has been present. In one of our series a perfectly formed four months' fetus was found. This is the only instance in hospital and private work, in our experience, where a fetus had been seen, and Edgar in a personal communication, states that he cannot recall a case where this occurred.

## CLINICAL HISTORY

All of these patients gave a history of irregular bleeding without pain, or a serous or sanguineous discharge containing vesicles. The septic patient had bled for seven weeks prior to admission; in another instance the patient stated that the fetus had been discharged one month prior to admission; in another instance the patient had bled for two months prior to admission to the hospital; in only four of our cases was the enlargement of the uterus out of proportion to the period of pregnancy and curiously enough all of these women were apparently four months pregnant. In three of our cases the uterus was actually smaller than the supposed period of gestation. It is interesting to note that in three of our cases, hydatid mole was found in the first pregnancy. Four multiparae had had no previous miscarriage. One multipara had had one miscarriage seven years before, and two multiparae had had three previous miscarriages.

## SUBSEQUENT HISTORY

All of the patients left the hospital in good condition within two weeks after removal of the mole with the exception of one woman who had a mild sepsis and remained three weeks in the hospital before her temperature returned to normal, when she also returned home in good condition.

We have endeavored to locate these patients in order to ascertain any subsequent developments and succeeded in getting in touch with six of them; they were all in excellent health and one (whose history I read before and who had passed a mole in May, 1921) has gained thirty pounds. The patient who became septic had a hysterectomy for uterine fibroids four months after leaving the hospital. She is now in good condition; no evidence of chorioepithelioma was found on pathological examination of her uterus. DeLee states that the

maternal mortality in hydatid mole is 13 per cent and gives the causes of death as hemorrhage, sepsis, uterine perforation and peritonitis.

#### TREATMENT

The treatment in all of these cases was manual removal of the mole where the mass had not been expelled spontaneously. We performed a digital curettage of the uterus; in some of the cases where we suspected the retention of some of the degenerated products of conception we first removed any débris with placental or sponge forceps before doing the digital curettage. The guarded use of a blunt curette may occasionally be necessary but we wish to caution against the use of a sharp curette on account of the extreme lack of resistance of the uterine musculature and the consequent danger of perforation. In all cases we were prepared to pack the uterus with iodoform gauze in the event of hemorrhage and inasmuch as hemorrhage is at times an alarming symptom it would be wise to make preparation for a transfusion.

#### CONCLUSIONS

1. That hydatid degeneration may occur at any age and at any period of pregnancy, being much more frequent however in the early months.
2. That on account of the toxic symptoms frequently shown the condition is easily mistaken for the toxemia of pregnancy until bleeding occurs and the appearance of vesicles clears up the diagnosis.
3. The uterus may be enlarged out of proportion to the period of gestation but as shown in our series of cases this is not the rule (four only showing such enlargement, while three were actually smaller).
4. These patients who have had hydatid mole should be kept under close observation for a period of years on account of the possibility of the development of chorioepithelioma.

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50 WEST FORTY-EIGHTH STREET.

95 WEST ONE HUNDRED AND NINETEENTH STREET.

## A CONSIDERATION OF THE PREGNANCY TOXEMIA KNOWN AS ECLAMPSIA\*

BY ROSS MCPHERSON, M.D., F.A.C.S., NEW YORK CITY

**S**PECULATIVE theories in medicine have had and always will have a prominent place in the art. Much that we have considered proved in the past and apparently clear enough in theory, turns out to be fallacious in practice and new lamps have been given for old in many instances, new lamps which have ceased to shine with the brilliancy they showed at the first lighting; and so we have, in part, at any rate, often returned to the scornfully discarded system for which they were exchanged.

Progress in the obstetric art, so-called, has been more marked in the last two decades than at any time in the history of medicine, but this advance has been so rapid, especially through the medium of surgery, that owing to the comparative safety of modern aseptic technic the surgeon rushes the patient to the operating table, many times it is feared, without due consideration of all the factors in the case. Far be it from the intention of the writer to belittle the marvelous strides and advantages of modern surgery, of which he is one of the most ardent and earnest advocates, but let us not forget in our enthusiastic moments that the *best* results in surgery are obtained by judicious operating at the right time in cases which will be *benefited* by the operation and not made worse. Babies were born, grew to mature estate, produced other babies and did surprisingly well both in their health and their duties to society in general, long before Lister discovered and gave to the profession the results of his theories which were so marvelous and far-reaching in their effects. True, of late years, we have reduced the mortality and morbidity of childbirth enormously in many directions, due to the knowledge and practical application of surgical principles to the subject in hand, but in other directions the improvement is not so marked if, indeed, any be noted at all, and it is of one of these instances that I wish to speak this evening.

Eclampsia, otherwise and more correctly known as the convulsive toxemia of the pregnant woman, has always been regarded as one of the most baffling conditions with which the physician has had to deal. Coming on with its lightning-like suddenness and, as was formerly supposed, in the absence of premonitory signs, signs which we have lately learned are present and usually can be recognized both by

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means of better methods of diagnosis and a more accurate and thoughtful study of the complication, it was, and still is, enough to strike terror into the mind not only of the lay observer but also of the medical attendant and as with the introduction of modern surgical methods it became easier and more simple to empty the uterus with speed, it is small wonder that operative intervention in these cases became the accepted and approved method of handling them. Appearing in the pregnant state, what could be more natural and reasonable than the theory that the pregnancy must be the cause of the condition and that therefore to help the patient, the provoking cause must be removed, a theory which seems sound and to a certain extent undoubtedly is.

Whether or not, however, the practice in popular vogue is always the best for obtaining this result is the matter before us for consideration tonight and with your permission, I would like to take up the subject in the following order: 1. Frequency of occurrence of eclampsia; 2. the symptoms; 3. the pathology; 4. the treatments commonly in vogue both past and present, with the idea of placing the complication on a more rational basis.

Williams<sup>1</sup> in his text-book, considers that an eclampsia occurs once in 130 cases; Cragin<sup>2</sup> once in 79 cases and other authors in about the same proportion. At the New York Lying-In Hospital in 120,000 cases we have had 890 eclampsias. This shows that we may expect in hospital practice to see a case of this description once in about 185 patients. The season of the year apparently has some importance in this connection as the cases are noted more frequently in the early spring than at other times and also greater numbers are seen some years than others. Its occurrence is almost twice as common in primiparae as in multiparae (64.4 per cent respectively), and as might be expected much more frequent in antepartum than in postpartum or intrapartum patients.

The greatest number of cases are noted between the ages of 20 and 25 years which is in accord with the statement that the greater number occur in primiparae.

The symptoms may be divided into (a) the premonitory or pre-eclamptic, and (b) those occurring after the convulsive seizure has taken place. Of these the pre-eclamptic warnings are the most important, as like storm signals at sea, if properly noted in time, preparation for the approaching tempest can be made, and often a port reached, which will frequently though not always, as some authors have said, enable us to avoid the storm altogether.

It is difficult to put in the proper order of their importance the pre-eclamptic signs and symptoms, many authorities disagreeing markedly on this point, but to the reader it seems that by far the most constant and most significant warning of an impending toxemic state in the

pregnant woman, is found in the blood pressure. In an otherwise normal patient, a sudden and permanent rise in the blood pressure is to be looked on with alarm and is never of slight importance.

Next in order we have the examination of the urine, not so much from the standpoint of the condition of the kidneys themselves, as an index of the degree of toxemia from which the patient is suffering, and thirdly the results of the ophthalmoscopic examinations of the eyes, which as they are becoming more common seem to point out to us a very important piece of information. Edema of the extremities, or of the body in general, tenderness over the gall bladder, nasal hemorrhage, various digestive disturbances, constipation and so on, are undoubtedly of importance and when present should be carefully noted and if possible treated and corrected, but the increasing blood pressure, the urine examination both regarding the increase of albumin and the presence of casts and possibly the nitrogen coefficient (though this is of doubtful value) and the presence of progressive changes noted by the skilled use of the ophthalmoscope, are all that the skilled obstetrician needs to put him on his immediate guard for the onset of the eclamptic seizure. These when present, with the convulsion, the coma, the cyanosis, the rolling eyes, clenched teeth and other familiar features, need no further description, and we will now proceed to consider the pathology of the complication, in the light of what knowledge we have been able to accumulate during the last few years.

For a long time the disease was thought to be of renal origin, and as such was considered an uremia. More careful and extended observation, however, has shown that the kidney involvement is entirely secondary, as evinced by the fact that we frequently see cases in which, although typical in every other respect, clinically the kidney is not involved, or not until late.

The typical lesions found are those of a degeneration of the parenchymatous organs, notably the liver, followed by the kidney, less commonly by the spleen and pancreas; this takes the form of an albuminous change known as cloudy swelling, passing on to fatty degeneration early in the disease, and later in the more aggravated forms extending to all the tissues. In the other toxemias of the nonconvulsive type, we find zonal necroses in the liver lobules. These necroses have been described by Schmorl<sup>3</sup> of Germany and Williams<sup>4</sup> in this country.

In eclampsia, on the contrary, we usually find extensive hemorrhages in and about the portal spaces, with very little zonal necrosis in the outer space of the lobule. The hemorrhages are general in character, usually being especially marked in the brain, about the corpus striatum and pons, rupturing into the fourth ventricle.

Welch,<sup>5</sup> formerly pathologist to the New York Lying-In Hospital, explains these hemorrhages by suggesting that there is circulating

in the blood a poison which causes agglutination of the red cells, forming emboli, and then the solution of the endothelium of the blood vessels allowing an easy means of escape for the blood into the tissues. The blood pressure is usually high, especially during the convulsions, a condition which increases the brain hemorrhages occurring in these young subjects who are usually free from arteriosclerosis. Welch believed that the poison causing the intoxication is probably an enzyme or a combination of enzymes which attack the cells and cause their destruction, the process being known as autolysis; this statement is particularly applicable to the liver.

Concerning the immediate sources of the poison, they have been regarded as four in number: the food, fermentation in the intestine, cell metabolism, and the fetus and placenta, with a possible fifth in the kidney. It is a well-known fact that the autopsy reports almost invariably show dilated ureters in women dying in advanced pregnancy, and from retention there may be some contributory share. With regard to the part played by the fetus and placenta, little is yet known, and whether they furnish a portion of the enzymes which attack the maternal organism as has been declared by some, is a question which the biological chemist has not yet answered.

Hunter<sup>6</sup> states that eclampsia is due to a toxin, but what that toxin is has not yet been shown. McGarrison,<sup>7</sup> in his work on the thyroid, gives the following suggestion: Spinal anesthesia is produced by injecting a local anesthetic, such as stovaine, into the spinal canal, that is, bringing a paralyzing substance, into contact with the spinal cord. If instead of a paralyzing substance an irritant, like the toxin of eclampsia, is mingled with the cerebrospinal fluid, we would expect the results of irritation, namely, convulsions, as in eclampsia.

If it be true that the eclamptic toxin is to be found in the cerebrospinal fluid, it must get there through the choroid plexus which normally secretes the fluid. The choroid plexus is a true secreting gland, and in health has a selective action which prevents toxic bodies passing from the blood to the cerebrospinal fluid. If from disturbed function this selective action is lost, toxins will pass through the gland to the spinal cord, and those toxins may be the toxins of eclampsia. McGarrison mentions two classes of toxins: (1) Those resulting from endogenous metabolism and (2) toxins of bacterial action. Possibly the first class, by their presence in the cerebrospinal fluid, is responsible for the symptoms of eclampsia. The kidneys under normal conditions would secrete these toxins. In pregnancy they are much increased in quantity.

From McGarrison's<sup>7</sup> work it seems reasonable that the bacterial toxins may bring about a disordered condition of the thyroid, and that

they are originated in the alimentary canal. He mentions the frequency of the enlarged thyroid in pregnancy. The fetus causes increased activity of the thyroid which is more easily disturbed on account of acting under greater pressure. Most obstetricians believe that the toxin of eclampsia is elaborated in the alimentary canal of the mother.

McGarrison<sup>7</sup> concludes that the bacterial toxins elaborated in the alimentary canal are absorbed into the blood and carried to the thyroid apparatus upon which they act injuriously and cause insufficient hormone production. This leads to choroid plexus insufficiency with loss of selective action which permits (toxic) endogenous products of metabolism to enter the cerebrospinal fluid, where they act upon the central nervous system and produce the condition of eclampsia. If this view be correct, the rational treatment would be:

1. To remove the organisms which form the toxins from the blood.
2. To remove toxins, both bacterial and metabolic, from the blood.
3. To remove toxins from the spinal canal.
4. To supply hormones to activate the choroid plexus.
5. To treat symptoms as they arise.

LaVake<sup>8</sup> states that in the field of obstetrics there is not a more interesting or more important problem than that of the etiology of pre-eclamptic toxemia and eclampsia. He groups the principal theories into: 1. Bacterial; 2. Auto-intoxication; 3. Nephritic; 4. Liver; and 5. Ovarian and placental.

*The bacterial theory* was presented as early as 1884. The main advocate of this theory has been Stroganoff, and his reasons for advocating are well worth citing: 1. General disease affecting all parenchymatous organs. 2. Acute infection commencing explosively or after a prodrome. 3. Fever accompanies it. 4. One attack confers immunity. 5. Marked genus epidemicus. In 1897 25 per cent died. In 1898 he had nineteen cases with a zero mortality. 6. It is impossible to explain the increase of eclampsia in populous centers otherwise than by accepting the infection theory. 7. As an argument against the uremic and fetal theories he mentions 126 cases, 10 of which occurred in the early months of pregnancy, and after the cessation of eclamptic seizures the pregnancy continued to normal termination. This could scarcely occur if eclampsia were due to toxins generated by the fetus. Early eclampsia usually affords the worst prognosis.

*The auto-intoxication theory* was brought forward by Bouchard, laying stress upon the toxins generated in intestinal stasis. He believes this view is tenable only from the standpoint of direct infection or absorption of toxic products resulting from the colon or other intestinal organisms.

*The nephritic theory* lays stress upon the presence of albuminuria and concomitant signs of nephritis with insufficient kidney function, the products of maternal or fetal metabolism being the offenders.

*The liver theory* accounts for the condition by the derangement of the liver structure and function as evidenced by anatomic and functional pathology.

*The ovular and placental theories* maintain the condition to be due to the generation of toxins from the products of conception or to infarcts of chorionic villi, and bring to their standard the force of the necessity of pregnancy in obtaining the condition.

LaVake states that in his experience the great majority of thromboses are caused by infection. For the past six years he has been interested in following cases with general pathologic conditions due to infections and trying to find the possible portal of entry. Obscure cases which clear up after the eradication of foci of infection are heard of every day. It has been proved that muscular pains have disappeared after the removal of infected teeth and tonsils. Cases of neuritis have improved under the same procedure.

Also, the author has been especially impressed by the cases of nephritis which clear up and remain so, after thorough eradication of dental and tonsillar infection.

Instances have been reported of eclampsia in the mother and nephritis in the child. Many have adduced from this that the products of the fetal metabolism causing the nephritis in the child were the cause of the eclampsia in the mother. It has been shown that organisms can pass from mother to child and it is possible that an infection was the cause of both conditions. Streptococci are the most common bacteria found in tooth and tonsillar infections, and their presence turns attention to those portals of entry in history-taking and in making complete physical examinations. The author calls attention to the absence of data regarding dental infection in many obstetrical histories and examinations. He presents 13 case histories of pre-eclamptic toxemia which came under his observation, cases which were typical and he dwells especially upon the histories of infection, where obtainable, and the evidence of infection. The data obtained in these patients point to the fact that it is important to eradicate foci of infection as soon as a case of pregnancy presents, or, if this is not possible, especial care should be exercised in determining the approach of toxemia. Every case should have a thorough dental examination and should be under the care of a dentist throughout pregnancy. The author disregards the belief of the laity and some of the medical profession that any dental procedure at this time is dangerous. He has never seen a case resulting in the disaster of an abortion from this cause and he has the assurance of many leading dentists that such an occurrence



has never come under their observation, although such men would undoubtedly use their judgment in avoiding long, tiring painful operations. The author concludes that adherence to the infection theory offers the best prospect of success in the prophylaxis of pre-eclamptic toxemia.

Thus it will be seen that while the etiology of the disease is by no means clear or settled, we still have made a marked advance over a few years ago, and are headed in the right direction. What the pathologist has done for us is to furnish the results of the findings post-mortem so arranged as to give us more definite ideas on which to work, and we believe that the time is not far distant when the actual toxin, enzyme or organism, which causes the complication and its method of operation, will be discovered.

Analyzing the situation, then, we are dealing with a woman who in the pre-eclamptic stage is just on the edge of being out of balance and who in the convulsive stage has lost her balance, so that in the first condition we must devote our efforts toward preventing the pathology from getting worse, thus allowing the convulsions to occur, and in the second to preventing them from recurring after they have occurred once, and incidentally only, of relieving the patient of the *cause* of her complication, namely the pregnancy; this latter, however, to be done without imposing on her a strain which will be greater than the one to which she is already being subjected.

I lay a great deal of stress on *the convulsions*, because I firmly believe that practically all of these cases die of brain hemorrhage due to rupture of the cerebral blood vessels, and that while it is not universally true that the higher pressure during the convulsion is the causative factor in the rupture of the vessel, it undoubtedly is the main one, as shown by treatment, of which more later.

It is acknowledged that we occasionally see cases which while otherwise presenting most of the features of the convulsive type pass away without any actual convulsions, but autopsy reveals the same brain hemorrhages as those present in the patients in whom convulsions did occur. These, however, are more profoundly toxic than the others and are apt to run a much higher continuous pressure which does not therefore affect our premise in the net result.

With these thoughts and facts before us then, let us proceed to take up the final subdivision of our subject, namely, the treatment. This may be divided into:

1st. Prophylaxis in the pre-eclamptic state.

2nd. Treatment of the actual condition when it has occurred. Both of these may be subdivided into (a) medical or conservative, and (b) surgical or radical.

Prophylaxis means watchful waiting. Watchful of small indicative symptoms, always suspicious that the blow is about to fall yet not rushing into operative procedures too hurriedly but waiting for a definite indication; in short, preparedness, in the most marked sense of the word. Every pregnant woman should be regarded as potentially pre-eclamptic, and that suspicion should not disappear until she has passed through her puerperium. Routine blood pressure, urine examinations and ophthalmoscopic inspections, together with general and special physical examinations should be made at frequent intervals, these to be increased generously if anything occurs which calls attention to any abnormal thing in the economy and it is only by this constant care that results will be obtained. It is often tiresome to physician and patient alike, especially to the latter, who cannot understand the necessity for such proceedings, and it is rarely wise to communicate to the patient the thought which makes us feel the desirability of these frequent visits. Still, the thing must be done, and faithfully, unless we are willing to take the chances of a severe catastrophe, which when in spite of these precautions occasionally does overtake us, is apt to reflect severely upon our professional judgment and skill, if all means possible for prevention have not been employed.

The diet should be regulated, meat and eggs largely discontinued, fluids given freely, proper exercise ordered and seeing that it is performed, sufficient sleep obtained and elimination by means of the bowels, bladder and skin secured. The teeth should be inspected and attended to. Printed instructions to patients are never given by the reader, as he prefers to consider each as an individual to be treated especially for the conditions suitable for her alone and not as one of a general class.

In the large majority of cases, if watched and handled in the above manner, no symptoms of toxemia will develop. Occasionally, however, in spite of this care, we shall one day, usually toward the latter part of the pregnancy, note a rise in blood pressure, possibly slight, possibly considerable, the urine may contain a trace of albumin and an occasional cast and eye changes may occur, slight but distinct.

We now come to the turn in the road. The signs point in two ways; shall we institute medical treatment and if so how rigid shall it be, or shall we terminate the pregnancy and if so by what means? What shall be the determining factor for the one or the other treatment? The writer confesses that he knows of no positive rule which should be applied in every case and the only thing that can be done is to be guided by one's experience and the judgment based on that experience. If rest in bed, low diet, possibly with an increase in the carbohydrate unit, elimination, etc., do not produce an amelioration of the symptoms or if they rapidly grow worse, termination of the pregnancy should be

considered before the patient has reached the point where the eclamptic seizures take place, and this termination if decided upon after such consideration, should be brought about by some one of the gentler means, in order to avoid the intense shock which otherwise may and usually does occur if the more forcible means are employed. Chloroform should never be used and rough manual dilation is absolutely not to be tried. Cases properly watched and cared for will rarely arrive at this stage, however, and we fortunately shall not often be called on to make the decision.

So much for the prophylaxis; we have seen that by its efficient use, the convulsive cases will be far less numerous than they have heretofore been. Nevertheless, there will always unavoidably remain the uncalculated few who, either from personal indifference or ignorance on their part, neglect on the part of the medical advisor, or a combination of both, or the very small proportion who though adequately and conscientiously cared for, still develop convulsions and who will demand all the resources we can bring to bear to suitably handle their complication.

As already stated at the beginning, the general feeling is still strong that the removal of the uterine contents is the most important step to be taken in the way of relief for the condition, and with the advent of modern surgical technic many operative procedures for this purpose have been employed. Rough manual dilatation followed by internal podalic version, with its resultant laceration and marked shock, vaginal hysterotomy, abdominal hysterotomy, have all been exploited and freely tried, and so firmly fixed are these maneuvers in the minds of most obstetricians that until comparatively recently they have been practically universally employed. The reader pleads guilty to having been one of the surgical enthusiasts until within the past five years.

Careful study of the results obtained both for mother and child, by these operative measures, compels thoughtful reflection, and when we consider that accouchement forcé give a maternal mortality of about 30.8 per cent, with an accompanying fetal mortality of 30-35 per cent, that cesarean section gives a high percentage of dead mothers with only a slightly improved fetal mortality, it makes one wonder whether or not these means of delivery are after all so efficacious as they would seem.

With this idea in mind, in 1916, the writer made up his mind to at least try out the Rotunda method of treating the actual convulsive cases, giving the method a fair trial, and to then compare the results with the operative method, with the idea of ascertaining if there was not some way in which at least an improvement in the maternal mortality could be made.

Since that time he has had 104 cases in which this method has been definitely followed; 17 mothers have died, or 16.3 per cent. Excluding those who were actually moribund when first seen, 7 in number, and in whom no treatment of any sort would have availed, this leaves a corrected mortality of 9.6 per cent for the net result, with a stillbirth mortality of 25.4 per cent. Certainly a startling difference when compared with the operative method which showed 30.8 per cent in 250 cases reported by the writer in 1909.

After this time a somewhat modified treatment was instituted which brought the mortality down to 17.4 per cent in 890 cases occurring in 120,000 confinements at the New York Lying-In Hospital up to January 1st, 1921. This, however, includes the author's 104 cases already mentioned which reduced the mortality figures considerably.

We now come to the conservative treatment so-called; this procedure was consistently carried out in all cases and unless the patients gave evidence of prompt delivery when the head reached the pelvic outlet, low forceps were permitted.

It is understood that all of the reported cases were pregnant or recently so; that they all had had one or more convulsions and represented true obstetrical convulsive toxemias.

Immediately on entrance to the hospital, the patient's blood pressure is taken, a catheterized specimen of urine secured, and she is put into an isolation room which is darkened and as much quiet as possible obtained. She is then given by hypodermic injection, one-half grain morphine sulphate, her stomach is washed out, two ounces of castor oil is poured down the tube at the end of the lavage, and she is given a colonic irrigation of five gallons of 5 per cent glucose solution.

If the blood pressure is over 175 systolic, phlebotomy is done, and a sufficient quantity of blood is extracted to bring the pressure down to 150; normal saline is not injected. In the experience of the writer, it is unwise to bleed the patient if the pressure is lower than 175 systolic, as if, for any reason, a good deal of blood is lost during the delivery, the pressure will be reduced so low that the patient may die from shock. The same objection applies to the *antepartum administration* of large doses of *veratrum viride*.

She is now kept quiet and one-fourth grain morphine administered every hour until the respirations drop to eight per minute. At this time convulsions have usually ceased, the patient will have fallen into labor, and, as has happened in practically all of our cases, will be delivered normally or by an easy low forceps in a short time. Occasionally the use of a little ether is necessary to control the convulsions while waiting for the effect of the morphine. The con-

valescence is treated in the usual manner, as indicated by the symptoms and has been in our patients significantly uncomplicated.

Summarizing our results, then, we see that:

1. The convulsive toxemia of pregnancy is a condition of whose exact cause we are unaware.
2. That the toxemia is divided into two groups: (a) The pre-eclamptic stage. (b) The stage of convulsive seizures.
3. That we can by careful watchfulness and intelligent supervision, largely prevent the condition from becoming severe, or from occurring at all.
4. That when it does occur, rough operative procedures do not give as satisfactory results either for mother or child, as does more conservative medical treatment judiciously combined with the gentler and less traumatic forms of operation.

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(For discussion, see page 83)

## BETTER OBSTETRICS AND THE PROBLEM OF THE BIRTH INJURIES OF THE NEWBORN INFANT\*

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FOR the past several years we have become fairly accustomed to have every writer and speaker in favor of "better obstetrics," refer to the appalling fact that "at least 15,000 women die every year in the United States from conditions, almost entirely preventable, caused by childbirth." The practically exclusive use of this one argument would seem to imply that conditions are entirely satisfactory as far as the newborn child is concerned. As a matter of fact they are not. It now is well established that approximately in 40 per cent of necropsies, performed on all stillborn infants and those dying within the first few days of life, definite traumatic intracranial lesions can be discovered, that roughly in about one-half of the cases these lesions are directly responsible for death, and that in the other half they represent more or less incidental findings though always proving the actual traumatization of intracranial structures during birth.

This newer information, in my belief, has not been sufficiently broadcasted among the very many physicians who are attending women in labor. Even expert obstetricians appear to be slow in appreciating their own obligations towards this problem of parturitional traumatization of the infant, and in recognizing the relation of this problem to that "better" obstetrical care which must be furnished to the women as well as to the newborn babies of this country.

Speaking here to a select group of experts I take it for granted that you are acquainted with this striking frequency of intracranial birth traumatisms so often emphasized in recent literature. You possibly are not aware of the fact that a more complete examination of the body at autopsy, a routine which includes the study of the vertebral column and a macroscopic and microscopic study of all abdominal viscera, reveals in a large percentage of the cases (exact figures are not yet available) also vertebral fractures, especially in the cervical section, or hemorrhages in liver, pancreas and very commonly in the suprarenal glands—all of them seemingly of traumatic origin.

Many entirely unsuspected birth injuries are discovered in a routine examination of every infant immediately after birth, if only more carefully done than is the prevailing custom, especially if such a

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\*Read at a meeting of the St. Louis Gynecological Society, February 23, 1922.

routine includes in every instance the palpation of the entire skeleton, an ophthalmoscopic examination, observation of the behavior of the child for the first few days of life and, in selected cases, in which some injury is suspected, an x-ray examination or a spinal puncture. A routine of this kind, here and there adopted in large maternity services, has led to the discovery of many important facts of which I shall mention but a few. Evidences of a retinal hemorrhage can be seen in about 20 per cent of normal sized infants born after normal spontaneous labors. This percentage of retinal hemorrhages rises to 40 in premature infants, and to 50 for babies born through contracted pelves. Probably in about 10 per cent of the cases a forceps extraction is followed by a facial palsy. Facial palsies are not exceptionally rare even after labors terminated spontaneously. The actual incidence of clavicular fractures is probably close to one and a half per cent of all deliveries, being apparently a little over 8 per cent for forceps extractions and around 6 per cent after version followed by extraction. I fear no contradiction in asserting that in the large majority of instances the attending accoucheur remains unaware of this injury to the clavicle. In most of the relatively few cases in which the damage is noticed at all, the discovery is made by nurse or mother if a larger callus forms.

Such a systematic search for injuries of the newborn has proved not only that traumatizations of all kind are fairly common but also that in many instances they are due to a brusque manipulation in the attempt to resuscitate the asphyxiated or seemingly asphyxiated newborn. In this manner are produced many slighter and severer lesions in the mouth, on palate and tongue, pulmonary injuries by means of the various pumps, clavicular fractures, shoulder injuries, fractures of ribs and, as irrefutably shown, intracranial lesions, vertebral fractures and liver ruptures. A simple consideration would seem to lead to the inevitable conclusion that swinging of the child, forcible bending and extension, or its mere suspension by the legs with the head hanging downwards, in the presence even of only a slight intracranial traumatization, must necessarily tend to increase the hemorrhage from an injured vessel, and especially so if the newborn's blood, as often is the case, exhibits an abnormal delay in clotting time. Incidentally I may point to the fact that the very traumatization of the child in birth will produce a clinical picture closely resembling that of deep asphyxiation, which, if not properly interpreted, necessarily leads to additional traumatization by the efforts of resuscitation. Among others, it was this reflection which prompted me to suggest the following systematization of all the many different causes of intracranial birth injuries advanced by various writers. The primary causes, possibly without exception, are of a mechanical nature. Intra-

cranial structures are damaged by the forcible, excessive or, especially, by the quick compression of the head. For the majority of these cases the responsible mechanical cause can be recognized in definite anomalies of labor, difficult forceps extractions, breech labors, difficult extraction of the aftercoming head, etc. There still remains a fairly large group of fatal intracranial injuries in which labor was easy, spontaneous, often precipitate, the child small, frequently premature. Also in these cases the immediate cause of the injury is a mechanical one—the compression of the head in its passage through the birth canal, both through its bony and its soft portions. We find that in these instances asphyxiation and, most of all, prematurity had rendered the infant abnormally susceptible to the trauma even of a seemingly normal labor, and must conclude that these conditions have to be regarded *predisposing causes* in the etiology of intracephalic birth injuries. In the presence of only slight intracranial lesions, a decreased coagulability of the blood and inappropriate manipulations during resuscitation necessarily tend to hasten, or to prolong, the escape of blood from injured vessels, though small, and thus hemorrhagic diathesis and all violent maneuvers during resuscitation represent definite *contributory factors* in the causation of cerebral hemorrhages.\*

After this digression I must return to the facts revealed by the systematic study of all newborn infants. Most important among them is the knowledge that a large number of children sustain in birth and, more often than generally appreciated, in the attempts to stimulate suspended respiration, injuries which do not prove fatal.

This, in my belief, is a most noteworthy fact. Obviously it suggests the question: "Are such injuries, at least in some cases, responsible for certain physical and mental defects manifesting themselves only later in life?" This is not a new question. Indeed, some time ago the neurologist answered it emphatically—too emphatically in my belief—in the affirmative. It was the neurologist who told the obstetrician that a "difficult" labor—whatever this term means—is an important etiological factor in the causation of feeble-mindedness, idiocy, epilepsy, speech defects and so on. More recently, obstetricians have exhibited an alarming willingness to accept the judgment of the neurologist, and we now hear from the obstetrician, and read in some textbooks of obstetrics, a good deal concerning the necessity of shortening labor by means of pituitary extract, by forceps extraction, or cesarean section in order to protect the child against an injury of its brain. Personally a most careful critical study of the problem has convinced me that the dreaded long continued compression of the fetal head proves decidedly less dangerous than its quick compression

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\*See, Ehrenfest, *Birth Injuries of the Child*, D. Appleton and Co., 1922.



by a forceps extraction or as the result of too large a dose of pituitrin. I cannot claim that my own conclusions necessarily are correct. This problem requires further study—by the obstetrician and not the neurologist.

Systematic studies, diligently made in large maternities, have, as already pointed out, established the fact that nonfatal intracranial lesions, retinal hemorrhages, fractures of various bones, epiphyseal detachments, and dislocations of certain joints are more common than obstetricians suspect or textbooks mention. Therefore, I also have come to the conclusion that many conditions, today somewhat indiscriminately termed congenital, simply because they existed since birth, really represent birth injuries; while again others, as e.g., torticollis, are not birth injuries, as commonly claimed, but represent truly congenital anomalies. This means anomalies of development during intrauterine life, as for instance now generally conceded for the hip joint dislocation, which not so long ago was still charged up against the obstetrician.

The obligation of the obstetrician towards the momentous problem of birth injuries of the child, as I see it, is twofold. He is obviously interested in the question of their successful prevention. He seems less aware of his great responsibility for their early discovery and accurate diagnosis.

In regard to prophylaxis the assertion can be made that, while certainly not all traumatization can actually be avoided, the incidence of the more serious injuries decreases more or less proportionately to greater expertness of the attending accoucheur. This expertness does not imply solely greater mechanical skill in the execution of obstetrical manipulations and operations, but also a diagnostic ability in recognizing minor anomalies in the configuration of the pelvis or in the mechanism of labor, and, finally, that undefinable quality of sound judgment in the decision whether or whether not, and at what moment, interference is necessary and likely to prove advantageous. The problem of prophylaxis has been rendered decidedly more complex by the recent knowledge that many of the serious and slighter traumas of the newborn are seen subsequent to spontaneous and quick labors, especially, of premature infants. In about 20 per cent of intracranial lesions, discovered at necropsy, the history shows that the labor had not been terminated by artificial means or operations but was normal in every respect. This newer knowledge has lessened but not eliminated that responsibility with which the obstetrician used to be charged for such injuries.

This again is a fact deserving emphasis. The obstetrician should show much less hesitancy, than in the past, to make openly the diagnosis of a birth traumatization. A more fearless attitude, in my be-

lief, would prove of incalculable value in the desirable improvement as regards the second relation of the obstetrician to birth injuries, namely, his responsibility for their prompt and correct recognition. This holds particularly true as far as the intracranial lesions are concerned.

The admittedly unsatisfactory results of their treatment, surgical and otherwise, in the main are due to the prevailing custom of not calling a consulting pediatrician or surgeon until the infant has general convulsions or is comatose, i.e., at a time when the infant is in a well-nigh hopeless condition, an extremely poor surgical risk, with the surgeon looking in vain for any symptoms that might offer a clue for a more exact localization of the hematoma. As a matter of fact, the very first signs of the intracephalic injury often are insignificant, at times not immediately noticeable. There can be no doubt that a more careful observation on the part of the obstetrician, who under prevailing conditions is the only one who sees the baby immediately after birth, would reveal in many instances a number of symptoms which commonly precede the first convulsion or the stupor. I cannot attempt to enter here into a thorough discussion of the early symptomatology of intracranial injuries and shall but briefly mention a few of these symptoms, recognizable only by careful study, occasionally of but short duration: A spasticity limited to one extremity; the extension of this spasticity to another extremity; the unilaterality of symptoms; the delayed involvement of cranial nerves; or a sequence in the development of these symptoms which occasionally, exactly like in an experiment, accurately indicates the primary focus of the hematoma and its gradual extension in a certain direction within the skull. An immediate ophthalmoscopic examination, a study of the blood clotting time, and a prompt spinal puncture furthermore are diagnostic, and the latter incidentally also therapeutic, procedures of an importance which is not as yet properly appreciated by the obstetrician.

Careful examination and observation of every newborn child, particularly when including an eye examination, will reveal in many cases a marked spasticity in some muscle groups, a paralytic or paretic condition in others, slight convulsions or retinal hemorrhages, all symptoms that might disappear more or less promptly and by their very evanescence will suggest that the infant apparently is in a perfectly normal condition. A continued observation of this group of infants, extending into later childhood or even into adult life—obviously to be made by the obstetrician who alone had noticed these symptoms—is likely to enable the obstetrician some day to solve authoritatively the problem of the truly congenital or traumatic origin of certain pathological conditions, and to furnish a definite answer to the mooted

question of the etiological importance or unimportance of particular traumatizations in birth for physical and mental defects manifesting themselves only later in life.

I maintain that today the obstetrician is derelict in his duties towards the newborn child. As long as the conditions now prevailing in the practice of obstetrics force him to take sole responsibility for the newborn, or as long as unjustifiable jealousy and unwarranted pride prompt him to bar the pediatrician from the newborns' ward of the obstetrical department, he will have to exhibit more interest in the baby, at least during the first few days of life. I can assure the obstetrician that a keener appreciation of this obligation will not prove a task only onerous. He will discover, I venture to say, that the ever growing tendency to hasten labor or to make it a less painful procedure, is not entirely compatible with the best interests of the child. He will experience the satisfaction of his increased usefulness both to mother and child by not only preventing more successfully parturitional injuries of the infant, but also by protecting the child against the immediate or delayed consequences of such injuries, whenever he has recognized them promptly. To you, as expert obstetricians, I wish to point out the wide and virgin field for many interesting and valuable observations and investigations which offer fair promise for enrichment in our still limited information concerning the etiology, diagnosis and prognosis of the birth injuries of the child. The existing deficiency of knowledge of this vast and important problem can justly be charged against us obstetricians, who have persistently failed to study more carefully the newborn, and at the same time have, more or less deliberately, prevented the pediatrician, neurologist and surgeon from acquainting themselves with the behavior of the normal and abnormal newborn immediately after birth.

METROPOLITAN BUILDING.

(For discussion, see page 99)

# ORGANIC DISEASES OF THE NERVOUS SYSTEM COMPLICATING PREGNANCY: WITH A REPORT OF TWO CASES\*

BY EDWARD A. SCHUMANN, M.D., AND HARRY S. FIST, M.D.,  
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ORGANIC disease of the nervous system, coincident with and complicating pregnancy and labor, is fortunately an event of rare occurrence. In reviewing the literature, however, one is struck by the comparatively large number of reported cases, the lesions ranging from mild postpartum neuritis or pressure palsies to complete transverse myelitis with its usual fatal termination.

Two cases recently observed by one of us, have led to a survey of the subject especially from the standpoint of the relationship of pregnancy and nervous disease with respect to etiology. The field is an enormous one and there has been no attempt made to study it in its entirety, but two varieties of disease being considered, puerperal neuritis and acute transverse myelitis. The first case to be reported is one of complete transverse myelitis.

The patient was a primipara of twenty years, white, of good heredity, the past history irrelevant, with no illness save the usual diseases of childhood and with no history of trauma. The girl became pregnant a few months after marriage, the pregnancy proceeding normally for the first three months. She then noted some weakness of the legs together with occasional shooting pains. The weakness became progressively worse and extended from the legs to the thighs.

She was seen by one of us in consultation with Dr. George E. Shaffer, when seven months pregnant.

At this time there was complete motor paralysis of both legs; the skin was anesthetic and did not react to a pin prick although there had previously been some hyperesthesia noted. The patellar reflexes were absent and the muscles of the legs and thighs were flabby and presented no contracture or spasticity.

The bladder was completely paralyzed, a period of retention having been followed by urinary incontinence. The sigmoid and rectum were paralyzed, the manual removal of feces being obligatory. The chest was negative, and the reflexes above the level of the first lumbar vertebrae were unchanged.

The blood showed a moderate anemia with a leukocytosis of 10,000. Wassermann reactions of both husband and wife were persistently negative. In view of the conditions found a diagnosis was made of complete transverse myelitis and hospitalization and termination of pregnancy by cesarean section was advised. Both were refused and the patient became steadily weaker, more toxic as a result of kidney and bowel retention and finally died of toxemia and exhaustion when ten months pregnant, the fetal heart having ceased to beat some two weeks before the death of the mother.

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\*Read at a meeting of the Philadelphia Obstetrical Society, February 2, 1922.

There was no uterine contraction nor any evidence of beginning labor at any time. Autopsy was not permitted.

Several analogous cases are noted in a cursory survey of the literature but it is noteworthy that in analyzing the labors of patients suffering from transverse myelitis it is found that most of these develop painless uterine contractions and in general are delivered spontaneously, practically without the use of the abdominal muscles.

Whether this is due to the location of the spinal lesions, the cutting off of the fibers at a higher level in one case than in the others is not known, but as the uterus is under control of the sympathetic, we cannot consider this a factor.

Two suggestive case reports are appended.

Robinson, G. D. *Proc. Royal Soc. Med. (Sec. Obst. and Gyn.)* 12:22. Jan., 1919, reports a case of labor in a paraplegic woman. The patient, aged thirty-one, was a seven para with one miscarriage. Attack began with four days' aching pains followed by paralysis of legs and abdominal muscles, with retention of urine and feces. Bedsore developed. Leg reflexes absent. Pain and tenderness in back at about tenth dorsal spine. Later there was incontinence of urine and feces. Diagnosis: Complete transverse myelitis in the dorsal region. At term this patient delivered herself spontaneously of a living female child. Labor was painless and unassisted by the abdominal muscles. Involution proceeded normally and the patient made an uneventful though slow recovery.

Meyer C., *Zentralbl. f. Gynäk.*, 44:238, March 6, 1920. Reports a case of a spinal cord tumor in pregnancy. A twelve para, three months pregnant, seemed to be suffering from multiple sclerosis. Following some treatment for the condition she began to have severe pain and twitching in legs with the development of a flaccid paralysis in the right and spasticity in the left. For two months there was incontinence of urine and feces. K. J. reflexes were present in both sides, left stronger than right. Babinski, left doubtful, right strongly positive. Speech and sight unimpaired.

At term patient went into painless labor and was delivered of a fetus with occiput posterior, without use of abdominal muscles and without sensation other than a slight pulling.

After delivery a decubitus ulcer developed and the patient subsequently died.

Autopsy disclosed a diffuse intramedullary tumor in lower cervical and upper thoracic region, which was found to be a sarcoma.

A consideration of these cases inevitably leads to the query as to what association exists between pregnancy and acute inflammatory diseases of the cord. According to Coplin the etiology of acute myelitis is probably always infective, toxemic, traumatic, hemorrhagic, or embolic.

Inasmuch as the toxemias of pregnancy are still almost unexplored territory to the pathologists it may well be that some bizarre trend of the toxins originating during gestation affects the cord. This relation is at best, however, a remote one and the writers fail to find

in the occurrence of myelitis in pregnancy anything more than a coincident infection.

The treatment of this complication of pregnancy is unsettled, there being no definite rule established presumably by reason of the rarity of the associated conditions. In the three cases quoted two of the patients delivered themselves spontaneously and apparently without the use of the paralyzed abdominal muscles. In the third case there was no attempt at labor, no uterine contractions, the child dying post-mature and the mother eventually succumbing without any evidence of labor. Two of these cases resulted fatally, one recovering. It would seem that in view of the very grave nature of transverse myelitis, the child should be sacrificed in the interests of the mother whenever the cord lesion is apparent before the time of viability. If the condition should be due to a pregnancy toxemia, certainly the source of such toxemia must be eliminated and if, as is probably the case, the myelitis is purely coincident, the mother should be saved from the strain of pregnancy that all of her bodily resources may be utilized to combat the dangerous infection from which she is in peril of her life.

Therefore we think pregnancy should be interrupted in the presence of acute transverse myelitis if the lesion is discovered before the viability of the child.

When the child is viable, the patient should be delivered as soon as practicable with a view towards saving her from any longer pregnancy than is absolutely necessary for the life of the infant. The method of delivery will vary with the individual case, from induction of labor by bougies or bags in the less advanced case to cesarean section preferably under local anesthesia in the grave cases. Delivery should be performed in some manner at the earliest possible moment. The puerperium of victims of myelitis who survive labor, should be managed with regard to the general systemic treatment of the disease and especial care must be taken to prevent the development of decubitus ulcers to which such patients are so prone.

Turning now to multiple neuritis the writers desire to report the following case:

A para ii of twenty-six entered the Frankford Hospital with a history of one instrumental labor with a dead infant.

The present pregnancy had been noteworthy by reason of protracted hyperemesis during the first four months with persistent indigestion and evidences of toxemia recurring all through the pregnancy. The woman entered the hospital in labor the membranes having ruptured some time prior to admission. On examination she was found to be a fairly well nourished woman, the chest negative, the abdomen much enlarged by the presence of a large fetus approximately 52 cm. in length. The pelvis showed a moderate anteroposterior contraction with true conjugate of somewhat under 9 cm. In view of the previous obstetric history cesarean section was advised and accepted; the operation proceeded without incident, a high

incision Säger section being done. Mother and child progressed uneventfully for six days when the mother suddenly complained of intense pain in the left arm and shoulder. Embolism was feared but the condition remained unchanged for two days, the only evidence of illness being a slight elevation of temperature and the intense pain. Suddenly the right foot and lower leg became the seat of severe pain while the shoulder and arm improved. At this time the patient developed a train of mental symptoms with fits of loss of memory and marked apathy alternating with restlessness and uncorrelated delusions. With this development it became apparent that the case was one of multiple neuritis with toxemic cerebropathy or as it is generally termed the Korsakoff syndrome, which was first described by Korsakoff in 1887. At this time the temperature was slightly febrile, there was a moderate leukocytosis and the urine revealed a trace of albumen. There was a considerable loss of power in the extremities affected by the neuritis, which power was regained when the pain in that particular extremity lessened, the time averaging about forty-eight hours. The symptoms were to a considerable degree controlled by the exhibition of salicylates and after four weeks gradual improvement took place. At the end of two months the patient was well.

The association of multiple neuritis and pregnancy is a fairly common one, cases being not infrequent in all large maternity clinics. The disease frequently manifests itself during the latter half of pregnancy, when it is termed neuritis gravidarum. This variety of inflammation is usually not so severe or so persistent as that developing after delivery and known as puerperal peripheral neuritis.

These cases are so common and it is so usual to find neuritis occurring in a patient who presents definite signs of toxemia in some form or other, that a connection between the two seems obvious; but the pathogenesis is obscure and other than ascribe the neuritis to some indirect reaction to toxins, no mechanism for its production can be described. The association of the Korsakoff syndrome is not so common but mild cases of impaired memory and transient dementia do occur more frequently than is thought, the cerebral symptoms being so mild as to escape detection.

The attacks of neuritis come on suddenly, any extremity or group of extremities being affected, and the pain is apt to suddenly shift from one group of peripheral nerves to another. Slight elevation of temperature is the rule and there is ordinarily some leukocytosis.

The treatment is to be directed toward the elimination of toxins by general measures and active steps must be taken to relieve the severe pain. Splinting the affected extremity, counterirritation and the exhibition of salicylates internally seem to give the best results. Opium is commonly required during the first stages of the disease.

124 SOUTH EIGHTEENTH STREET.

1225 SPRUCE STREET.

(For discussion, see page 91)

# ABDOMINAL PREGNANCY AS OBSERVED IN THE CHARITY HOSPITAL OF NEW ORLEANS

BY P. GRAFFAGNINO, M.D., NEW ORLEANS, LA.

(From the Department of Gynecology, Tulane University.)

**D**URING the year 1920 the writer, in reviewing the cases of extra-uterine pregnancy recorded at the Charity Hospital, New Orleans, from 1906 to 1920, found so many interesting cases of advanced extra-uterine, or so-called abdominal, pregnancies, that he deemed it of some scientific value to record these cases, an added incentive being given by the fact that it was his privilege recently to have such a case come under his own immediate observation.

Alfred C. Beck, in the *Journal of the American Medical Association*, September, 1919, and John M. Maury, in *Surgery, Gynecology and Obstetrics*, November, 1920, have so thoroughly covered this subject that anyone interested in it should by all means read their reviews and their most valuable conclusions.

In this paper I will record only those cases in which the diagnosis of advanced abdominal pregnancy was positively established by operation, x-ray, or the passing of fetal bones. From 1906 to 1920 approximately 18,835 cases were admitted to the various gynecologic services of the Hospital, and among the cases recorded as extrauterine pregnancy, only eleven cases could be considered as positively filling the above specifications. The first case is the writer's own, the others are summarized from the Hospital records.

CASE 1. Colored female, age twenty. Occupation: housework. Previous history negative, menses regular, with severe dysmenorrhea. Married at 13, one child eight years old, normal delivery. No miscarriages. She had missed her periods for eight months, then they reappeared three months prior to her admission. When they reappeared, she states that she passed some sort of sac, and she felt life until this resumption of her periods. About ten days before admission her local doctor drained off a gallon of bloody fluid by inserting a trocar in the midline between the umbilicus and pubis. She had been lactating for three months. Bowel function regular, some nocturia. Physical examination showed the abdomen to be that of full term pregnancy, with parts palpable, but no heart sounds heard. Chadwick's sign present. The cervix was small and anterior lip was slightly softened, but not enough so for an advanced pregnancy. Behind the pubis was a hard mass about the size of a fist, apparently connected with the cervix, and perhaps the fundus of the uterus. Above the mass in the abdominal cavity was a large, irregular, hard mass, about the size of a seven months' pregnancy. The x-ray report was that a fetus was present within the abdomen, with the head to the right; other laboratory reports were negative. Four days after admission, under ether,



a median incision was made, extending about two inches above the umbilicus. Within the cavity was found a large sac containing a full term, macerated fetus, the position being almost transverse, with the head in the right iliac fossa. The fetus was delivered without difficulty, but the placenta was intimately adherent to the fundus, and almost to the posterior surface of the uterus. It appeared to have undergone a waxy degeneration, and it was almost impossible to separate it from the uterus, so subtotal hysterectomy was done, taking off the fundus above the level of the tubes and ovaries. The sac, which had also undergone waxy degeneration, was so intimately adherent to the parietal peritoneum and the abdominal viscera, that most of it was allowed to remain *in situ*; what could be peeled off without injury to the surrounding structures was removed. Closure without drainage. The patient made an excellent recovery, the wound healing by first intention, and was discharged thirteen days after operation.

The fetus weighed 2812.32 gm., and was 45.72 cm. long. The F. O. diameter was 11.0 cm., B.P., 9.0 cm. The placenta weighed 952.56 gm., was 12.5 cm. in diameter, and 6.0 cm. thick. The cord was 35.56 cm. long.

CASE 2. August, 1920. Colored female, aged thirty-one. Previous history negative. She stated that she considered herself eight and a half months pregnant, but could not recall the date of her last menses. At no time had she had any feeling of faintness, sharp pain, or any symptom which would suggest tubal pregnancy. Forty-eight hours before admission she considered herself in labor, though the pains were cramping rather than bearing down. She was in bad condition when admitted, her pulse weak and rapid and she gave signs of exhaustion. The examination was negative, except for a hard mass at the left of the umbilicus, taken to be the fetal head. Operation the day after admission, under ether, in the midline. A full term, viable fetus, which lived only a few hours was delivered, but the placenta was very firmly adherent and was not removed because of the fear of hemorrhage. Closure with abdominal drainage. Following operation she was very restless, with pain, and nausea not relieved even by gastric lavage. Her temperature ranged from 102° to 104°. On the sixth day she had a profuse hemorrhage through the wound, following removal of the drain. She was put on the table at once, almost cyanosed, and with a very poor pulse, and the placenta and membranes removed under nitrous oxide. Saline infusion was given on the table, but her pulse was imperceptible at the conclusion of the operation and she died five hours later.

CASE 3. This was a colored female, age ninety, who entered the Hospital Sept. 28, 1920, complaining of shortness of breath. The previous history was negative, menstrual history without incident. She had had no children, and had had her menopause at forty. It would be well to remark that the patient was of a low grade mentality, and her history was secured with difficulty. The physical examination revealed a hard mass fixed in the pelvis at the left, suggesting a fibroid, the other findings being irrelevant. Fourteen days after admission the patient died, the diagnosis after autopsy being cardiac hypertrophy and dilatation, acute nephritis, and chronic passive congestion of the liver and spleen. The peritoneal surface was smooth, moist and glistening, with a small amount of free fluid throughout. The uterus, which presented apparently a leiomyoma undergoing calcification, extended above the brim of the pelvis, and when opened, was found to be posterior to this mass described as a leiomyoma. The right tube and ovary were easily traced out, the left tube was obliterated and apparently surrounding

the mass previously described. The left ovary was small. Sagittal section of the mass revealed a calcified, well defined fetus.

CASE 4. September, 1920. Colored female, age thirty-four. Occupation, house-work. Previous history negative. Menstrual history regular. According to her statement, her menses were last seen eighteen days before admission, though her present trouble had begun ten months previously, with nausea, vomiting, and severe pain in the left abdomen, which continued intermittently for two months. Two months later the pain continued in the right iliac and inguinal regions, and was stationary. About this time a mass appeared in the abdomen, which increased in size, and was slightly movable. The woman considered herself pregnant. Examination was negative except for a large mass like a fibroid in the region of the liver. Vaginally, the cervix was hard, and a mass was palpable at the left, which seemed to be the uterus.

Under ether, an exploratory laparotomy was done in the median line, and a mummified seven months' fetus was found free in the cavity. The placenta was attached to the body of the uterus and to the right tube. The fetus was removed, and supravaginal hysterectomy was done, with right salpingoophorectomy. The patient had gall stones, but nothing was done in that region. She was discharged as cured sixteen days after operation.

CASE 5. November, 1917. Colored female, aged twenty-nine. Previous history negative. Menstrual history without incident. Seven children, the last being still-born. At the time of admission she considered herself almost nine months' pregnant. Three months after the onset she saw blood for two days, otherwise she had a normal course. Five days before admission she began to have severe abdominal pains, which she insisted were not labor pains, and from that time she saw blood. The physical examination was negative, except that the abdomen was pendulous. Fetal parts were palpable on the left, and the breech extended three fingers above the umbilicus. On the right was a large, soft mass, apparently independent from the fetus. Vaginally, the head was well engaged in the pelvis, in the right oblique diameter, with the face under the pubis. Over the head was a thick membrane, apparently the posterior vaginal vault, and no cervical ring could be made out. The cervix could be felt high up behind the pubis, pushed to the right, and connected with a mass on the right of the abdomen, which was taken to be the pubis. Laparotomy was done under ether in the midline, and a dead, full-term fetus, weighing 5.88 pounds, was extracted, left salpingoophorectomy being done also. The amniotic sac was plastered over with omentum, which stripped off easily, and there were no adhesions to the intestines or abdominal wall. The uterus was large and boggy and pushed to the right, and about the size of a three months' pregnancy. The placenta was attached to the old ruptured tube, the ovary, and the upper portion of the broad ligament, and nourished by the ovarian artery and uterine anastomosis. The ovarian artery was hypertrophied to the size of the internal iliac. The patient was discharged as cured seventeen days after operation.

CASE 6, October, 1916. Colored female, age thirty-eight. Previous history negative, except for an attack of acute P. I. D. (?) two years previous, treated by douches and rest in bed. Menses regular, last seen eight months before. She had had leucorrhea all her life, but none for the last seven months. She had first felt life five months before admission, but had felt none for the last two weeks. For the last two months she had had unusual abdominal swelling, with a feeling of

tightness, pain in the right lower abdomen and lower back, and sensations of dizziness. She was poorly developed and nourished, heart rapid but regular, milk in the breasts, and the abdomen was so distended that the diaphragm was pushed upward. The walls were very tense and fluid seemed to be present. Vaginally, the cervix was almost obliterated and pushed to the right. There was a small mass at the left, probably the displaced uterus, or an ovary. No ballottement. Six days after admission laparotomy was done, under ether, in the midline, disclosing a large sac adherent to the abdominal wall anteriorly. It was partially freed and aspirated, revealing a blood-stained, brownish fluid, with yellow flocculi and shreds of tissue. The fluid was withdrawn by trocar. When the sac was opened, a full-term dead fetus was delivered, and the cord clamped. As the placenta was firmly adherent, it was not separated from the sac wall, but the sac was seized between clamps and freed from the entire abdominal wall, omentum, intestines and mesentery. The omentum was ligated *en masse* and the sac delivered. In the pelvis were found two small fibroids to the left of the mass which was taken to be the uterus, at the right of which the sac arose. The cervix presumably led into this mass, as well as into the uterine cavity. The left tube and ovary were intact, the right could not be differentiated. The sac, the uterus, and the left tube were removed *en masse*, and later the cervix was removed, and a pack put into the vagina leading to the pelvis. The abdomen was also drained through a stab wound in the left.

The patient made a good recovery and was discharged as cured twenty-eight days after operation.

CASE 7. August, 1913. Colored female, age thirty-four, occupation, housework. The only statement secured from this woman, as she deserted almost at once, was that for some time past she had been passing by rectum what she took to be fetal bones. An x-ray was taken, which showed bones, presumably the femur, in a sac adherent posteriorly, and communicating with the sigmoid. Then, as stated, the patient deserted, and her subsequent history could not be secured.

CASE 8, July, 1910. Colored female, age twenty-six. Previous history negative. Three children, one living, one miscarriage. Ten months before admission she was taken with sudden abdominal pains and was in bed for three months. She saw no menses for five or six months, then her periods were regular again, though more profuse. Three months after this attack, and ten months before admission, she felt fetal movements and considered herself normally pregnant. Throughout this period she had had severe abdominal pains and, towards the last, there was unusual swelling and tightness of the abdomen. Examination showed the abdomen to be markedly distended, with the walls very tense and sensitive to pressure. Vaginally, the cervix was almost obliterated and pushed to the right side of the vault, and a small mass to the left was taken to be the uterus. Laparotomy was done, under ether, in the midline, and a large fetal sac, containing a dead fetus, apparently full term, was found in the region of the left tube. The dense adhesions, particularly of the bowel, were dissected, and the tube cut close to the left cornu. A cyst of the broad ligament on the right was also removed. The patient made a good recovery, and was discharged as cured seventeen days after operation.

CASE 9, April, 1909. Colored female, age twenty-eight. Previous history negative. Menses regular. One living child, one miscarriage. At the time of admission she had not menstruated for 18 months. Four or five months after their cessation she had been taken ill with nausea, vomiting, and severe abdominal

pains, and about five months after this attack she had seen bones projecting through the abdominal wall in the region of the umbilicus. She came to the Hospital with a bottle of fetal bones, and the presumption was that she had removed them herself. Physical examination showed a large ulcer near the umbilicus, which presented a foul discharge, and from which a tiny bone was then projecting. Under ether this ulcerated sac was opened, without entering the peritoneal cavity, and the remains of the skeleton of what appeared to be a four months fetus were removed. There was a communicating passage between this sac and the lower bowel, which later closed spontaneously. She was discharged thirteen days after operation, but returned to the clinics for treatment until the superficial sinus was completely closed.

CASE 10. April, 1907. Colored female, age twenty-eight, occupation, housework. This woman was admitted with a very vague history of some large mass in the lower abdomen, associated with high temperature. Operation was advised by her local physician, who does not seem to have considered her pregnant. Vaginal examination, under ether, revealed a condition resembling pelvic abscess, but when an attempt was made to puncture the mass, the sponge holder was withdrawn with a fetal arm. Immediate laparotomy was done in the median line, and two dead feti of different ages were removed. The history is most disappointing, giving absolutely no further data concerning them. The patient herself, after a stormy convalescence, was discharged as cured on the sixty-first day after operation.

CASE 11, November, 1906. Colored female, age 26, occupation housework. Nothing of note in her previous history, menses always regular. She was admitted with a diagnosis of probably dead fetus. The external conjugate was 19 cm., the intercrural 25 and the interspinous 24. Vaginally the cervix was found to be hard and elongated, hypertrophied and not patulous. A mucopurulent discharge was present. Sixteen days after admission laparotomy was done, under ether, in the median line, and a dead, full term fetus was found, covered with membranes that were adherent to the bowels, uterus and appendages. The fetus was first removed, and then a large mass, evidently the placenta, with a large, organized clot of blood, which had become encysted in the fimbriated extremity of the left tube, was ligated and removed *en masse*. The adherent membranes were removed piece by piece, and because of the dense adhesions, right oophorectomy with partial right salpingectomy was also done. The patient made a good recovery and was discharged as cured twenty-eight days after operation.

Summarizing these eleven cases, it is interesting to note that in every instance the patient was a colored woman. The ages range from 20 to 90, in the last instance the diagnosis being established by post-mortem many years after the pregnancy occurred. It is also interesting to note that the only fatality in the series of operated cases occurred in the only case where the fetus was viable. In the other cases, where the operation was deferred beyond term, or where the child was taken before the patient was at term, the results were uniformly successful, proving that abdominal section, where the diagnosis of abdominal pregnancy is established, has no higher mortality than ordinary gynecologic surgery, provided the operation is timed correctly.

# Society Transactions

## THE NEW YORK OBSTETRICAL SOCIETY

MEETING OF FEBRUARY 14, 1922

THE PRESIDENT, DR. R. H. POMEROY, IN THE CHAIR.

*Program Contributed by the Members of the Staff of the Sloane Hospital*

DR. WILLIAM E. CALDWELL demonstrated a **New Leg-Holder for Gynecologic and Obstetric Use.**

The leg-holders here illustrated (Fig. 1) are designed to support a woman's thighs and legs during obstetric and gynecologic operations, without putting strain

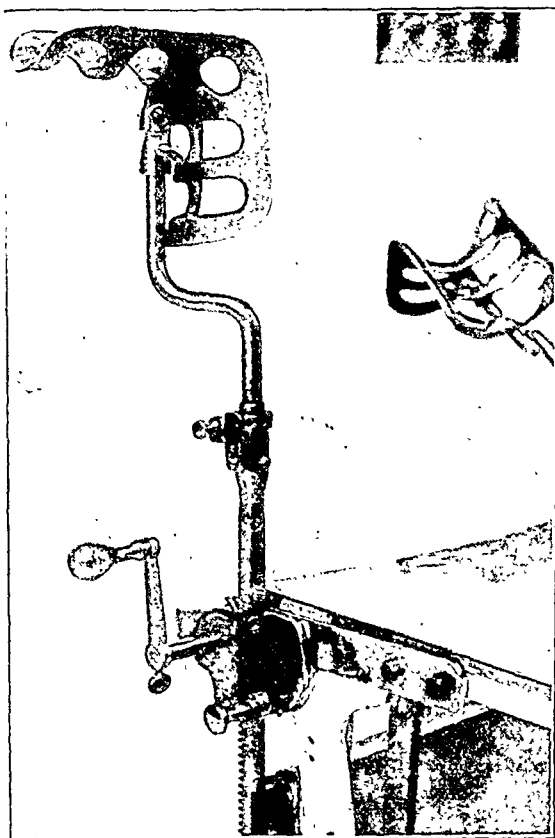


Fig. 1.

on the lumbar or abdominal muscles or pelvic joints, and without distorting the soft parts of the genital tract. They also allow easy changing from one position to another, frequently necessary in obstetrical and gynecologic operations, without



Fig. 2.



Fig. 3.

disturbing the surgical "set-up." These leg-holders allow combined vaginal and abdominal manipulations or permit the placing of an assistant between the thighs in gynecologic operations, as is practiced in Wertheim's clinic. They are easily adjustable from the side, and the pelvis can be tilted readily into various positions.

The crutch proper is a bronze casting, shaped to hold the knee comfortably. It is on a swivel joint, permitting easy, comfortable adjustment and is held securely in position by tightening the thumb screw. The crutch is connected to a round, cold-rolled steel rod, terminating at a swivel joint which permits adjustment of the crutch from right to left, thereby increasing or decreasing the distance between the two crutches. A spring catch, operating in grooves, holds the crutch firmly in place, after the desired position is obtained. To the joint is attached a milled, cold-rolled steel square rod, which operates in the raising and lowering mechanism. This mechanism consists of a set of milled steel gears concealed in a metal casing. The gears are turned by a removable swivel hand crank. A ratchet stop holds the crutch firmly in place when set at the desired height. The crutch may be swung to any desired position from the horizontal to the vertical, and then set by means of an additional strong spring catch, operating in a series of bores and firmly held in place when set. By this adjustment the crutch may also be swung completely around and down to the side, so as to be out of the way when not in use. The crutch is attached to a bracket equipped with bores and bolts so that it may be attached to any operating table.

These leg-holders allow us to place a patient in position with thighs markedly extended and to raise the thighs by means of the swivel crank all the way back to extreme flexion (Fig. 2), or to bring the thighs from extreme flexion downward into a position of extreme extension (Fig. 3), the rods shortening as the thighs are brought down and lengthening as the thighs are brought up. Thus, any degree of extension or flexion can be obtained and the position held by means of the large pin next to the crank.\*

## DISCUSSION

DR. ROBERT L. DICKINSON.—The textbooks on gynecology though largely operative, may be said to give no consideration to the organization of the operating room, and of the operation as such,—even the books on operative gynecology, save Doederlein, being very incomplete. No gynecology considers whether a leg-holder may give backache or damage a sacroiliac joint, nor do they advise the moderate flexion of the thighs in a laparotomy which will relax abdominal muscles, nor a little pillow under the lumbar spine at operation to save grievous postoperative backache. My association with an orthopedist has demonstrated the unnecessary damage to sacroiliac joints. In women with long legs, with relaxed muscles, or with sacroiliac joints predisposed to injury, the ordinary method of hanging the legs by the ankles is reckless disregard of joint injury. Postoperative backache is added distress which our patients may well be spared. Thrombophlebitis is favored by any of the crutches that press in the popliteal spaces, and probably by an unpadded Goepel knee trough. The ankle-hung foot is a device especially planned to put the foot in the way of each assistant. He must duck under it or stoop over it. The thigh bent on the abdomen and the leg on the thigh gets the lower limb more effectively out of the way than any other scheme, but it, too, inflicts damage on the pelvic joints and adds kneeache thereto, relaxed as everything is under anes-

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\*The Sloane Hospital is indebted to Miss Marie Louise Duchesne for working up many of the details of the leg-holder with the Hospital Supply Company of New York.

thesia. To merely let the assistant shove the leg aside produces the same result. The leg trough of Goepel renders the most complete support and has this advantage, it is useful in both abdominal and vaginal work. For laparotomy it gives the slightly bent thigh that relaxes the abdominal muscles and holds the patient from slipping (the shoulders of course, taking most of the weight), while the patient can be quickly swung into position for vaginal work, the legs held by the same device, and without change in the leg drapes.

The support of this device presented by Dr. Caldwell is better than the Goepel universal joint, in that the joint is difficult to keep locked, and because the new arm permits elongation as the Goepel stalk does not. A sleeve on the Sloane device would allow the legs to swing open more widely and freely. If Dr. Caldwell's holder could swing far down enough to give the Waleher posture we should have every possible demand satisfied.

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**DR. WARREN HILDRETH presented a report of a case of Premature Separation of a Normally Implanted Placenta.**

The patient was 34 years old. She had never had scarlet fever, diphtheria, tonsillitis, venereal disease or operations. The only fact bearing on her former kidney condition is that she was refused for life insurance in 1915, on account of an unsatisfactory urine specimen. Her menstruation began at 18, every 28 days, normal in duration and amount, and without pain. Her last menstrual period was August 15, 1919, making her probable date of confinement May 22, 1920. During her pregnancy, she was never ill. She saw a doctor only once during her antepartum period. From May 1st, about three weeks before term, she first noticed swelling of the ankles. However, she continued her work as a dressmaker, fitting and draping until 7:30 each evening. She laced her corsets almost as tightly as before her pregnancy, so that none of her friends knew of her condition. She, frequently, had considerable abdominal pain after bending, while tightly laced.

On May 6, two weeks before term, she worked particularly hard, went to bed and slept well until 4 A. M. of May 7, when she awoke with severe abdominal cramps and moderate vaginal bleeding. She was seen by a physician at about 10 A. M. and sent to the hospital. On admission, her general condition was excellent, her pulse was 90, her systolic blood pressure 150, and her urine contained a heavy trace of albumen. On examination of her abdomen, the uterus was found to extend to a point 3 cm. below the ensiform. It was hard and fairly contracted, but relaxed slightly at times. It was impossible to make out the fetus, and there was no fetal heart and no ballotement. On vaginal examination, the head was found presenting and the cervix 1 cm. dilated, soft, and about 2 cm. thick. No placenta was felt.

Without anesthesia, a No. 2 Voorhees bag was inserted, hoping to deliver patient from below. After the insertion of the bag, the patient rested quietly and slept most of the following night. When examined on the morning of May 8, the bag was found still tightly wedged in the cervix. The uterus was still regular in outline, but now extended to the ensiform. It was board-like and had no periods of relaxation. Although the patient had a normal temperature and a pulse of 80, she looked anxious and did not seem to be in as good condition as one would judge from her pulse and temperature. On consultation with Dr. Studdiford, and under his direction, we did a cesarean section. Under ether anesthesia, the abdomen was opened with a low median incision. There was a large amount of blood-tinged



fluid in the abdominal cavity. The uterus was very slightly rotated to the right. There were huge, deep purple veins making a large mass either side of the uterus. The uterus, tubes, ovaries and broad ligaments were swollen, edematous, and almost black in color. There were numerous large ecchymotic spots scattered over the surface of the uterus, directly under the peritoneum. The uterus was opened and the placenta found completely separated, with about a quart of old clotted blood between the placenta and the uterine wall. The placenta had been attached to the anterior portion of the upper uterine segment. The placenta was a deep purple color, and its surface was covered with old clots. The child was 50 cm. long and weighed 7 lb. 4 oz., and had apparently been dead for some time.

After emptying the uterine cavity, the wall of the uterus was observed for a number of minutes. The muscle remained flabby and showed no tendency to contract, except over a small portion of the lower segment. There were large thrombi in the veins along the cut edge and the color of the uterus changed very little after the relief of the tension. Therefore, a supravaginal hysterectomy was done, fearing to leave the uterus on account of later necrosis and infection, or postpartum hemorrhage from its atonic walls. Along with the uterus the tubes and ovaries were removed, because of their swelling and engorgement.

*Pathologic Report*, by Dr. W. C. Johnson.—In the hemorrhagic areas, the decidua is normal in thickness. It shows no hemorrhage or necrosis, but is rather diffusely infiltrated with a considerable number of polymorphonuclear leucocytes. The myometrium shows pathological alterations throughout its entire thickness. There is a moderate edema of the interstitial fibrous tissue, separating the bundles of smooth muscle. Throughout these edematous areas, around blood vessels, also frequently invading the bundles of smooth muscle, is a variable amount of cellular exudate.

There are no hemorrhages in or adjacent to the decidua, but passing outward toward the peritoneum, at first small hemorrhages are found between muscle bundles, then the hemorrhages become larger and, finally in the outer quarter or fifth of the uterine wall, the hemorrhages are so large and confluent that the muscle fibers appear as small islands entirely surrounded by blood. The smooth muscle fibers show the hypertrophy characteristic of pregnancy, but do not appear as sharply outlined and distinct as in a normal contracted postpartum uterus. The fibers in the hemorrhagic regions, especially in the groups surrounded by hemorrhage, are pale and swollen. In spite of the diminished number of muscle nuclei visible, and the altered appearance of the muscle cells, it is not possible to state definitely that any of the cells are actually necrotic.

The blood vessels through the uterine wall do not show any significant changes; no vascular lesions can be found which would explain the hemorrhages. Sections of the uterine walls show no organisms. The placenta shows no changes of any significance.

There are three conditions present: 1, inflammatory reaction; 2, interstitial hemorrhage; and 3, degeneration and possible necrosis of muscle fibers.

Any one of the three may be primary. It is possible that the inflammatory exudate is not directly related to the other lesions, but is simply a reaction to the separation of the placenta and the irritation of the retained placenta and blood clot lying within the cavity of the uterus. This seems the simplest explanation, as the reaction is greater toward the decidua, while the hemorrhage and muscle changes are more marked toward the peritoneal surface. This still leaves unsettled the relation between the hemorrhages and the degenerated changes in the muscle fibers. The muscle cells had no alterations sufficiently marked to lead one to be-

lieve that an adequate explanation of the condition could be based on muscle degeneration and weakening.

On the other hand, the condition of the blood vessels does not indicate either venous stasis or lesions of the vessel walls which might lead to rupture. Two changes occurred, either degeneration of muscle fibers, or interstitial hemorrhages of the myometrium.

The patient's postoperative course was uneventful. The albumen, which only once showed as a sediment on boiling, quickly cleared up and her systolic blood pressure fell from 150, just before operation, to 110 on discharge. Since operation, the patient has had no symptoms referable to the pelvis. She has had no hot flashes and is no more nervous than before operation. Her systolic blood pressure now is 130; her urine contains no albumen or casts.

We report this case to demonstrate an excellent result following cesarean section and hysterectomy. Among the cases classed as accidental hemorrhage, there are a certain number which show large subperitoneal hemorrhages, as well as large hemorrhages into the outer portion of the myometrium. In these cases, the shock is usually considerable. The uterus is too severely injured to react to any stimulus tending to delivery from below. For this reason, and because of the subsequent danger from infection and postpartum hemorrhage, the delivery should be by cesarean. The question of hysterectomy in each case would depend on the condition of the uterus at operation. It seems that the mortality would be greatly reduced by following this less conservative treatment.

Dr. Willson, in the January, 1922, number of *Surgery, Gynecology, and Obstetrics*, reviews the literature and gives a maternal mortality of 55 per cent for similar cases. In this case, there were present two causes for the hemorrhage: 1, toxemia, and 2, venous stasis from extremely tight lacing, a fact of great importance according to Morse.

#### DISCUSSION

DR. A. H. MORSE, NEW HAVEN, CONN.—This very interesting case illustrates the most serious type of separation of the normally implanted placenta with concealed hemorrhage. The dissociation of the myometrium of which Dr. Hildreth spoke is the type of lesion which we have found in all the cases which we have had in New Haven. In going over the sections from the uteri of these cases I was unable to demonstrate in the vessel walls the changes which Dr. Williams mentions in his paper. On the other hand in one case in which the uterus failed to contract following delivery, and in which hemorrhage made a supravaginal hysterectomy necessary, there was thrombosis of the veins of the broad ligament. Sections taken through the lateral wall of the uterus and the broad ligament showed definite laminated thrombi; in other words it was clear that in this case thrombosis occurred before operation.

Now it happens that last night we had a case of premature separation of the placenta of the less serious type. The patient entered the Hospital in the eighth month of pregnancy with a systolic pressure of 155 and with slight uterine bleeding. Several years previously she had suffered from a nephritic toxemia, with convulsions. Since the uterus was contracting upon admission, we felt that in spite of a partial separation of the placenta no radical treatment was indicated. However, the cervix was slow in dilating, and as the bleeding became a little more profuse, we inserted a Voorhees bag. This morning she was delivered of a still-born child. The uterus contracted satisfactorily and there was no free bleeding during the third stage. The placenta showed a large collection of blood clots with

a flattening of the placental tissue beneath it. There was probably no hemorrhage into the myometrium in this case.

It is interesting that there had been tight lacing in Dr. Hildreth's case. This perhaps caused a disturbance of the venous circulation. I do not believe that a marked rotation of the uterus is necessary to bring about such a disturbance. Moreover the position of the uterus as we see it when the abdomen is opened may differ from the position which the organ occupies previous to operation.

I have discussed the question of toxemia as a cause of this complication of pregnancy with biochemists, and we have difficulty in conceiving of a toxin which would so acutely affect the blood vessels of the uterus and no others. Of course the question is not entirely settled but I believe that it is due to an interference with the venous circulation.

DR. C. PAUL HUMPHSTONE.—Whatever may be the cause of this particular condition which is associated with toxemia and hemorrhage into the uterine muscle and ablation of the placenta, in dealing with it we have come to recognize that there must be a different treatment applied to the cases which are in labor with some dilatation, and the cases which are not in labor.

I have handled seven cases of ablation of the placenta, in which we did cesarean sections, and found that there was no necessity to take out the uterus in any one of these cases, and not a single one of them died. While the uterus seemed soft and flabby and had this bluish-purple appearance underneath the surface, nevertheless we sewed all these uteri up, and in due time they contracted without undue hemorrhage from the vagina and got well.

We have at the present time a case in the hospital that came in with  $3\frac{1}{2}$  fingers' dilatation, with a dead baby. She was  $7\frac{1}{2}$  months pregnant, with ablation placenta. We simply incised the cervix and pulled the baby out with the forceps. She had no unusual hemorrhage after packing the vagina.

Are we not unduly alarmed about postpartum hemorrhage in these cases? We don't find many fatal cases reported. My experience has been that by simply doing a section and sewing them up, they get well and may have another baby.

DR. JOHN O. POLAK.—It is our custom, in these cases, when admitted, to measure the fundus and mark the size of the uterus, and the blood count and hemoglobin are taken at very frequent intervals, as well as the pulse, and if abdominal distention is accompanied by a rise in pulse and particularly a drop in hemoglobin, which is very rapid in these cases, a hysterectomy is done. Most of these cases, however, can be treated on the expectant plan.

DR. J. MILTON MABBOTT.—The case raises the question as to when involution begins. Does it begin when the uterus is emptied, or when the child dies, or when the placenta is completely separated from the placental site in the uterine wall?

In this case we can assume that the placenta was fully separated about three days before delivery. If we assume that involution began three days before delivery, the fatty degeneration of the muscular fibers, due to involution, would have progressed so far that that would account for the failure of the uterus to respond to the dilator. In other words, the failure of the uterus to contract and expel its contents, would naturally make the cesarean operation a proper means of emptying the uterus under those conditions.

DR. W. W. HERRICK read a paper (by invitation) entitled **Pregnancy and Heart Disease from a Medical Viewpoint**. (For original article see page 1.)

#### DISCUSSION

DR. GEORGE N. SLATTERY (by invitation).—Dr. Herrick's quotation of Dr. Mackenzie should be a matter of particular authority, both from the standpoint of the cardiologist and the obstetrician. It will interest you to know that he, while bearing international fame as an authority on the heart, had an experience with many laparotomies and obstetrical cases. He was a general practitioner in the broadest sense. This would seem to qualify him particularly as an authority on such a subject as pregnancy complicating cardiac diseases. His big contribution was the investigation of heart cases from the standpoint of disturbed rhythm. In a practical way he stressed the importance of remote signs rather than the immediate heart murmur. I wish further to quote him as to the importance of signs rather than murmurs. By way of example, pectoral tenderness and anginoid pain may be of more grave prognosis than the usual signs of broken compensation.

I feel somewhat qualified to endorse Dr. Herrick's comment concerning anesthesia. In a year or two, an opportunity was given me of observing the circulation from the anesthetist's viewpoint. This experience emphasizes two points brought out by Dr. Herrick, namely: first, the importance of relief from apprehension during the pre-anesthesia stage; second, that ether is definitely the anesthetic of choice in cases where the circulation is a particular consideration.

I have come in contact from time to time with obstetricians who have asked my opinion as to whether certain heart conditions would permit the continuance of pregnancy. These cases often were considered by the men sending them to me as probable mitral stenoses. It so happened that most of them were what is now called, neurocardioasthenias. In other words, neuroses of the heart. Not a new condition, for in the Civil War it was known as "soldier's heart." The more recent verbiage was selected during the World War. In order to separate the neurocardioasthenic case from the true mitral stenosis, a history is essential. This particularly applies a search for rheumatic history on the one hand, or a neurotic personality on the other.

From a limited experience, and perhaps a little thought, I am inclined to leave this suggestion with you, that, in accord with the Mackenzie teaching, who, by the way, was rather a good obstetrician, most obstetricians stand in too much awe of their cases with heart complications.

### OBSTETRICAL SOCIETY OF PHILADELPHIA

STATED MEETING, FEBRUARY 2, 1922

THE PRESIDENT, DR. STEPHEN E. TRACY, IN THE CHAIR

DR. ROSS MCPHERSON, of New York, read, by invitation, a paper on **The Conservative Treatment of Eclampsia**. (For original article see page 50.)

#### DISCUSSION

DR. BARTON COOKE HIRST.—The speaker correctly states that no one single method of treating this condition will apply to every case and had I adopted a single method in all my cases in the last few years, I would have felt that I had

not given the patients a fair chance for recovery. I have used the morphia treatment for years, I believe in a rational manner. If a woman comes into the Hospital deeply comatose and remains so, with only one or two convulsions during her attack, it seems to me morphia would be inappropriate. If, on the contrary, convulsions are frequent and violent, morphia ought to be given in full doses to the extent Dr. McPherson advises, for unquestionably, the convulsions alone will kill the patient, but they are not the only cause of death. I gave up the exclusive operative treatment long ago, before 1909 I am sure, having had the same unfortunate experience with it that other observers have had. I think my clinic here was one of the first to abandon the theory that the main thing was to empty the uterus. Now one finds an agreement on this point everywhere. From an average death rate of close to 30 per cent with operative treatment as the main reliance, there is now in general an average mortality of 15 per cent or lower. But the operative treatment has a place in the therapeutics of eclampsia, and a more important place, I believe, than Dr. McPherson ascribes to it. Our utilization of the operative treatment is thus standardized: We apply what we believe to be all the rational methods and if they fail, then we turn to an operation as a last resource and we find that, preceded by elimination, sedative treatment, and all the measures to reduce blood pressure, it gives us surprisingly good results. If, indeed, we were to judge by these figures alone, we might claim that the operative treatment was the best for all eclampsia cases. In the last five years in the University Hospital we have not had a single death from it although we have only resorted to it in the worst cases. We have had in the five years preceding this, 89 cases of eclampsia: In seventeen instances cesarean section was performed without a death from the operation. There were two deaths following the operation, one three weeks later from staphylococccemia after the eclampsia had long ceased and the other from gangrene of the lung, also some weeks after recovery from the eclampsia and the operation. These deaths cannot be fairly ascribed to the operative treatment, but our mortality would have been considerable had we not prepared the patient to stand the operation by the treatment that preceded it. There is one treatment not referred to at all tonight. I understand the purpose of Dr. McPherson's paper perfectly, namely, to show the results that can be obtained by the sedative treatment alone; and they are most creditable, but I would like to emphasize the importance of the eliminative treatment, especially by the skin, a treatment apparently at present out of fashion. I heard Dr. McPherson refer to the eliminative treatment as excellent in the prophylaxis of eclampsia; if it is good in the pre-eclamptic, it ought to be good for the eclampsia itself. I think that a clinical observer with ordinary powers of observation, who sees this treatment properly conducted with a sweat cabinet, must admit it is efficacious; and it seems to have a logical basis. It is true that nobody knows what the toxins of eclampsia are or how they are eliminated, whether mainly by the kidneys, the skin or the bowels, but it is equally true that no one can say that the toxins are not eliminated by the skin, as well as by the bowels, the kidneys being temporarily out of commission. Every case of eclampsia, moreover, is secondarily a case of parenchymatous nephritis, with uremia superadded to the original toxemia. No one denies the utility of diaphoresis in the latter condition. The elimination by the skin also diminishes the hydraemia of pregnancy and, I think; lessens the danger of those multiple apoplexies, especially of the brain, so often found in a fatal eclampsia. Sweating also reduces blood pressure and thus is of value. The objection that it concentrates the toxins is met by routine proctoclysis alternating with the sweats. Like every one charged with the responsibility of a large maternity

hospital, I feel that the management of eclampsia is one of the most serious problems with which we are confronted.

DR. EDWARD P. DAVIS.—While we do not know the real cause of eclampsia, recent additions to our knowledge of its pathology cannot fail to be interesting and valuable. Since the close of the recent war the obstetricians and obstetric pathologists of England and Germany have been working anew at this problem. You will remember that some years ago it was stated that the toxemia of early gestation was caused by the absorption of fetal elements and there is much in favor of this view. Continuing this line of thought, a study of immunity and careful observations in microscopic anatomy and biochemistry have been made concerning the production of toxins by the placenta, the placenta containing as we remember, large quantities of fetal elements. It has been distinctly shown that from these substances are obtained certain toxins closely allied in chemical composition to the poison of certain serpents. One of them has an extraordinarily selective effect upon the cells of the liver and the parenchymatous cells of the metabolic organs, causing their destruction. One of these toxins attacks especially the substance of the kidney and these toxins exercise a most extraordinary effect upon the blood making and secretory glands of the body; the ultimate result of this action being the formation of minute emboli and thrombi carried by the toxin-laden blood extensively throughout the organism. This study links up the early involvement of the ovum with the toxemia of late gestation and gives the mechanical explanation of convulsions and also the explanation of the fact that eclampsia commonly ceases after the birth of the child. It is a matter of observation that within 36 hours after the uterus is emptied these trophoblastic elements cease to manufacture toxin and that is the reason why eclampsia ceases about that time.

Personally, I have always considered eclampsia as a case of toxemia and it has seemed to me that the primary factor in treatment was elimination and after trying all sorts of methods and having been one of the army of operating enthusiasts who gave it up, and I think obstetricians ceased to operate earlier than others, I have devoted my attention to ridding the blood of toxins and under no circumstances doing harm by a forcible method of emptying the uterus. So far as eliminative treatment is concerned, I am much in favor of venesection and the substituting of saline or glucose fluid and I do not take blood pressure as an indication for or against bleeding; the degree of toxemia, if I can make out, is the indication and the worst toxemic cases I see have a low blood pressure and not sufficient resistance to produce convulsions; and I would gladly take from them some blood and substitute a fluid which I hope will be of greater service. Elimination produced by gentle sweating, lavage of stomach and leaving in the stomach a laxative and copious lavage of the bowels and letting patient alone so far as the labor is concerned are all important factors in treatment. When she shows effort and desire to empty her uterus then help, if help be needed. At the same time I am in full agreement with Dr. Hirst that there come times when operation is indicated. For example, a stalwart young woman and fetus with good sound heart beat, is taken with a sudden outbreak of severe eclamptic convulsions. It is not quite time for labor and the cervix is tightly closed. Is it not then better to give her vigorous eliminative treatment and unless she immediately ceases to have convulsions, to operate, preferably an abdominal section, and empty her uterus? Should we not, too, carefully guard our patient's vision, and I am glad to observe Dr. McPherson's precaution in the matter of ophthalmoscopic examination. May I suggest that in my experience the removal of cerebrospinal fluid in patients who show beginning

changes in the retina is distinctly a conservative procedure and in our experience has greatly lessened the damage done to the eyes in these cases. Certain it is that prophylaxis must remain our great hope. Equally certain it is that wise conservatism has greatly lessened our mortality and morbidity.

DR. RICHARD C. NORRIS.—The diversity of opinions as to the etiology of eclampsia almost makes one believe that the convulsive seizures in pregnant women are perhaps analogous to convulsions in young children; that is, they are simply a symptom and that there is a multiform etiology. If the origin and qualities of the toxins, as pointed out by the reader of the paper, differ, we perhaps ought to concentrate our thoughts on that, and our treatment in some respects ought to be varied as the etiology seems to be. Surely with our lack of knowledge of what is going on in a pathologic way in our patient as the result of toxins, the origin of which we do not know and the destructive damages of which we cannot always predict, a uniform treatment as Dr. McPherson recommends cannot be equally efficacious in all cases. I am one of those who has never departed from the less aggressive form of obstetrical treatment. I believe that the effort to relieve the woman of the fetus, simply because we consider pregnancy the cause of her condition, is only applicable to the point when you see her approaching the danger zone. If pregnancy and eclampsia must be associated as cause and effect, the rational view to take of that phase of the subject is that the pregnancy should be ended before the patient is seriously damaged by the presence of the fetus and that dictum finds its true application in the induction of premature labor, when the removal of the fetus will do the most good. That argument has never appealed to me in the treatment of the patient actually eclamptic, whose liver, kidneys or brain may have widespread lesions that cannot possibly be restored by removing the fetus at so late a period of the disease. In the presence of an actually eclamptic patient, so far as our present knowledge goes, we only know and believe that she is a victim of a deadly poison of unknown origin. Our treatment should be concentrated on that idea and we may differ in our opinions as to the various procedures to secure elimination and combat the effects of that poison but if that is made the keynote of treatment we have gone as far as our knowledge warrants. In addition to that the stage of labor, the condition in which we find our individual patients, the clinical degree of the toxemia, the patient's history, the frequency of the convulsions and her mental condition between seizures, blood pressure, her cardiac action, her temperature, the kidney condition, and other clinical data, will influence the obstetrical and medical treatment.

I have treated some of my cases with cardiac stimulants rather than depressants, when even in the early stages the cardiovascular system has been almost overwhelmed by the toxemia. I believe I have saved life on many occasions by using caffein and even digitalis rather than depressants like veratrum.

As we study our cases clinically to appraise them as to the gravity of the toxemia so we must study them from the operative standpoint. Herein lies the strength of what several speakers have said. In a vigorous primipara, with undilated cervix, who has been treated by eliminative treatment, and in whom a prolonged labor is certain, cesarean section will probably be of advantage. If however, there are widespread destructive lesions, the removal of her fetus by cesarean section may come too late to save her. The same may be true of forceps delivery in multiparæ. The results of any operative delivery will depend more upon the degree of toxemia and its pathologic results than upon speed in delivery. As to eliminative treatment, you will find men varying in their opinions. Dr. Hirst has

pinned his faith to the excretion through the skin. I consider purgation a more valuable means of elimination, not that I would neglect elimination from the skin, but in my clinical experience I have not seen a woman die from eclampsia where I have secured very free catharsis,—twelve or more evacuations within twenty-four hours and where the bowels did not respond I looked upon the patient as overwhelmed and the prognosis as almost hopeless. As to edema and the introduction of saline, I have been called in consultation to see women die because too much salt solution, without its elimination, has produced edema of brain and lungs. I think administration of salt solution, whether it follows bleeding or not, should always go hand in hand with the blood pressure apparatus. That is one's guide as to how frequently it should be repeated and with the degree of catharsis, the amount to be used is indicated. Now as to the use of bleeding; a pale, anemic, long continued toxic woman, with in some cases, a blood pressure which is below what you would expect in eclampsia, failing to respond to elimination and distinctly asthenic, is never benefited by bleeding, nor would the use of any of the cardiac or cardiovascular depressants like veratrum be indicated. As to the use of forceps, there is no question as to the advantage of terminating labor when that stage has been reached and I think we all agree to that. The real crux of the matter is, shall we consider speed in delivery as the first essential. If that ground be taken then cesarean section would be indicated for more cases. On the other hand if speed has no real value then all cases should be treated as outlined by Dr. McPherson. I find I am not in accord with either of those positions.

In a group of 23 cases of eclampsia in 5,000 consecutive patients at the Preston Retreat, which Dr. Bernard and I studied, and I reported in 1918, with two deaths, (8.9 per cent mortality), only one had rapid obstetric delivery, a case of vaginal cesarean section in a primipara. She died on the ninth day of pneumonia and the other woman died twenty-four hours after a simple low forceps operation. In that group there was no hurried obstetric treatment.

The outstanding fact from my experience in the "Retreat," is the experience gained from these cases in the pre-eclamptic stage. Treated by induced labor the convulsive outbreak is usually avoided.

We should urge the general practitioner to watch his cases and never let them go to the eclamptic stage. One of the striking results of the "Retreat" is, that we do not get the eclamptic cases that we did prior to the institution of the prenatal service. The real value of the prenatal clinic is the avoidance of neglected cases. To recapitulate, the eliminative plan of treatment is at the present time the best we know and the obstetric or surgical treatment of these cases must be determined by two factors, the clinical study of the individual case but from the standpoint of toxemic gravity and especially the appraisalment of the soft tissues of the birth canal as an obstacle to the relatively early delivery. That helps me in my work more than any other two factors in deciding for or against a rapid delivery. Not knowing the actual degree of pathologic degeneration in the organs, a relatively quick delivery seems to me the wise course. It is not, however, a question of a few minutes rather than a few hours.

DR. WM. R. NICHOLSON.—I am still treating eclampsia in the same way that I have done all my professional life. I have never been attracted by the immediate operative delivery, but have always felt that elimination was the prime essential. The only exception to this plan in my practice, has been years ago, when the Bossi dilator first came into vogue. I am sorry to say that I did attempt to use it in a very few cases, but was immediately convinced that any form of



accouchement forcé was very ill-advised. At the present time, I am using more morphia than in the past, but I do not believe that the eliminative treatment should ever be made subordinate to the morphia except under conditions in which the eliminative treatment cannot be used for lack of proper nursing care. I particularly want to emphasize my thorough agreement as to the advisability of venesection and I am also greatly interested at this time in the use of sugar solutions intravenously. I think the work recently reported by Dr. Titus, while of course still not conclusive, is extremely interesting and well worth following out. I believe that eye-ground examinations as an index of interference in cases of toxemia, cannot be depended upon, as eclampsia attacks may occur before albuminuric retinitis is present and therefore, it is unsafe to wait for the development of this condition before inducing labor. In brief, I believe that at the present time, the proper treatment is the eliminative treatment for from six to twelve hours and then if the patient is not improving, it is necessary to take the chance of the operative delivery by whatever method is the least harmful to the woman, whether it be cesarean section, forceps or version.

DR. GEORGE M. BOYD.—It is as interesting to hear a conservative paper on eclampsia as it is to hear a conservative paper on any subject today in midwifery in this day of version as a panacea by one man and forceps another and cesarean section for eclampsia by the third. We have followed at the Lying-In-Charity of Philadelphia for thirty years the conservative treatment. We have been using morphia, elimination, blood letting and finally in the exceptional case resorting to surgery. The German method of using morphia in larger doses was instituted by Veit.

DR. WILLIAM E. PARKE.—I have recently reported thirty-six cesarean sections for eclampsia; so I should like to enter a plea in this meeting for this method of treatment in a certain group of patients. By this group I mean primiparae who are not in labor, and who fall into convulsions before labor sets in. Those of you who have done these operations must, I think, have been impressed as I have, with the instant cessation of all convulsive phenomena as soon as the operation is done. Patients who may have been having convulsions at fifteen- or twenty-minute intervals stop abruptly. Only five of the thirty-six patients had a convulsion following the operation. Now I, of course, do not advocate cesarean section for every case of eclampsia, but for the primiparae who have convulsions and are not in labor I think it is a worth while thing to do. Moreover, any conservative treatment you can employ without doing the operation, you can also employ with it; thus you have the added advantage of getting promptly rid of the cause, plus the conservative treatment.

Of the thirty-six cases I operated on, three died. One of these clearly should not be classed as eclampsia; it was a cardiorenal case with orthopnea and edema of the lungs in which the terminal event was a convulsion. Omitting this there were thirty-five cases with two deaths,—a percentage of 5.7.

DR. N. L. KNIPE.—I feel like answering Dr. Parke by saying that perhaps his good results from cesarean section were due to the letting of blood and in that way getting rid of a great deal of toxemia. I read a paper in 1916 on "The Treatment of Eclampsia", which gave very much the same results which Dr. McPherson has obtained. At the University, in Dr. Hirst's service, we carried out very much that same plan. Our chief eliminants are castor oil, if the patient is conscious, and croton oil if not; the sweating is simply a part in the whole of the eliminative treatment. We have always given morphia in severe convulsions. In 1916

I reported a mortality of six per cent in a series of 85 cases, including all except those dying within 24 hours, but including one dying a month after delivery.

DR. GEORGE CARSON HANNA.—In the discussion no one has spoken of the rights of the baby. Are there not cases, especially in young primiparæ, where the birth canal is not easily distensible and the cervix remains hard and elongated, where more radical measures would not increase the maternal mortality and yet get a living baby? If these are left to Nature, they often drag along for several days with its attendant danger to the fetus. While my experience is not as large as some here, yet I feel after a series of a hundred cases that one can be too conservative.

We are now in the treatment of this disease about where I started twenty-five years ago. Then it was watchful waiting, then came the era of operation and radical treatment. Once more the pendulum is turned backward, and now non-interference again is becoming the watchword. The sooner we realize that each case should be individualized and the personal equation of the individual taken into account, the better will be our results. For what would be good procedure for one might be highly improper for another.

DR. ALICE WELD TALLANT.—Everybody uses morphia, everybody operates when necessary and everyone does venesection. We individualize our cases and that after all is the only thing we can do. We cannot lay down a method of treatment that will suit them all. There was one class of cases not mentioned, the cases of postpartum eclampsia. Perhaps I have had very bad luck, but some of our worst cases at the Woman's College Hospital have been postpartum cases in which the question of delivery had no place. For a patient already delivered, we could not do cesarean section, and treatment by elimination, morphine and so on proved futile at times. It is usually stated, I think, that these cases are more benign than those occurring antepartum, but in my experience postpartum eclampsia has been so severe that if any suggestion could be added to help in the treatment of these cases I should be glad to hear it.

DR. DANIEL LONGAKER.—I would like to add one thought to this discussion. I think we should use a conservative rational treatment rather than the radical treatment of convulsions. As the last speaker has said, we all treat our patients very much in the same way. If they are efficiently treated conservatively I believe that a very large number of potential eclamptics will be cut out. I want to make a plea for compound jalap powder for elimination and I believe elimination by the bowel is safer. It may be a little disagreeable, but it is perfectly safe and efficient. The point of the hydremic character of the blood has been brought out and this hydremia is lessened by the jalap powder. Another point is the constant presence of acetone and diacetic acid, in other words, acidosis, in these cases. This gives a very valid ground for the application of alkalis which are certainly efficient in reducing tension. My colleague, Dr. Parke, is exceedingly modest and I think he has not said all that he could have said in favor of radical, or operative treatment. Over at the Kensington Hospital it is certainly a very popular plan and I think if we did not resort to it that frequently we would have to offer some explanation. The preceding speaker has said something about the rights of the baby. We do know that persistent convulsions treated conservatively result in a large fetal mortality.

DR. McPHERSON, (closing).—There are one or two things which impressed me very markedly and the first is that the Philadelphians are so universally ahead

of us in New York, because I assure you in New York the operative idea prevailed and has until comparatively recently. I thought I was presenting something reasonably new, although we have recognized Dr. Kniple's work and it has been stimulating to us for several years. Some of the younger members of this Society have had service under me in the Lying-In Hospital and Dr. Neely has had four cases successfully treated conservatively but lately he has fallen into the by ways and done cesarean sections. Regarding the statistics on cesarean section for eclampsia from all over the country, if they are taken and digested, notably a series of cases by Dr. Reuben Peterson, of Ann Arbor, in which he reported 500 cases of eclampsia treated by section with a high mortality, the figures from the clinic in Glasgow where they do a very large number of cesarean sections and the report from the Sloan Maternity Hospital showing again a high mortality, gives us an indication regarding the position of this operation. I must congratulate you gentlemen who can present a mortality of zero on Dr. Hirst's service up to about 9 per cent on Dr. Parke's. I say this wholly in the spirit of appreciation and I do not mean to be sarcastic but once when I reported 40 cases of eclampsia with a mortality of about 7 per cent, a colleague said, "When the Doctor has had more cases he will have a higher mortality" and I am wondering if in Dr. Parke's series he has run into his lucky streak, combined with his skill in operating which has made his results successful. I believe we do run into these streaks in eclampsia. I had a large series of cases which ran along without any deaths at all and I was convinced I had solved the problem. Then I had three deaths in succession. I agree thoroughly with the statement that there are some cases in which cesarean section is indicated; I myself did one several weeks ago on a young primipara who had a long, undilated cervix, who was at term, with the pelvis not any too large and it was highly essential to secure a living baby. At the same time I cannot feel that it is the indicated operation in the majority of cases. It seems to me from the general discussion that the subject divides itself into two things; that you all approve of either letting eclamptics alone, or operating on them, and I will agree with that. Then the next thing is that question of elimination. It interested me very much to hear what Dr. Hirst said, but I am somewhat disappointed because I have not had the same result. I gave up sweating my patients ten years ago because I lost so many of them in the pack; after all the skin is the poorest means of elimination we have. It does not eliminate anything but water in any marked amount and by this means you concentrate the toxins in the system instead of diluting them, which is not what we are after. As I have talked it over with men all over the country, the results obtained have been pretty generally in favor of discontinuing sweating. I have seen patients getting on pretty well, put in hot packs and then die. I am afraid of it, and it is not an isolated opinion upon my part. On the other hand, I realize that we oftentimes see results in some places which are very different from what they are in others. In so far as the blood chemistry is concerned, I did not go into that purposely, for we are still undecided as to what blood chemistry means and so far we have not been able to arrive at any conclusion that gives us any help. Acidosis apparently plays a very small part in the condition. There is an article in *The American Journal of Medical Sciences*, where this subject is very carefully worked out by Losce and VanSlyke and they showed that the part the acidosis played was very slight. In regard to transfusion with saline after bleeding, I have discontinued its use and I am inclined to believe that you can get as much good with large high colonic irrigations. By catharsis and irrigation I tried to convey the idea that I approved of these procedures in the article. Concerning two more things that were

brought up; first, the question of saving the baby. Of course there is not anybody more willing to admit that the baby ought to be saved than I am. After all that is the aim of the whole process not only to get a living baby but also to get a living mother if possible. It is a matter of fact in no case in which a fetal heart was heard at the time of admission in this series was the baby stillborn, except one and that had a cord complication which would have resulted fatally under any circumstances. Of the other babies that died there was no evidence of life at the time of their entrance into the hospital; and as to the question of long labor, as a rule the labor was not long, for after morphinization the labors were extremely rapid. The children were not subjected to anything like the trauma, or pressure that they would have been if the mother had been operated on. In regard to the treatment of postpartum cases, I regret that I cannot at this moment tell you just how many postpartum cases I have had, I agree that postpartum eclampsias are much more serious than antepartum, and our figures show that. It naturally follows that if pregnancy is the cause of the trouble and delivery does not relieve the patient that the condition must be severe. I have treated them in the same way by trying to control the convulsions and trying to assist elimination and have been reasonably successful.

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DR. E. A. SCHUMANN AND DR. HARRY S. FIST (by invitation) read a paper entitled **Organic Disease of the Nervous System Complicating Pregnancy with a Report of Two Cases.** (For original article see page 67.)

#### DISCUSSION

DR. EDWARD P. DAVIS.—This paper is germane to the subject of the evening, eclampsia and toxemia of pregnancy. We recognize, as has been said by the readers of the paper, that toxemia is the cause of neuritis and the cause of many of the peripheral nervous diseases in the cutaneous system, and also the cause of certain spastic and toxic conditions by virtue of multiple emboli of the nervous system. There is one disease of the nervous system, which is comparatively rare, fortunately, namely, acute meningitis accompanied by acute insanity. It is almost universally fatal and often in the acuteness of her insanity the mother does violence to the child. The mother invariably dies and the infant is rescued with the greatest difficulty. In nervous lesions complicating gestation one must always think of the presence of syphilis and the Wassermann reaction must be taken and all means taken to ascertain the truth.

DR. BARTON C. HIRST.—As a commentary on the induction of labor in these cases I recall one in which the termination of pregnancy had no effect upon the mother whatever, the myelitis steadily ascended until the woman died.

DR. ALBERT B. DAVIS, Camden, N. J.—A case of acute transverse myelitis which I saw, occurred about fourteen hours after delivery in a primipara, with a perfectly normal labor. I did not see very much of her before she came for delivery, but the only thing at all abnormal that I know about her is that she seemed to have a little uterine inertia, she was a rather weak woman and I gave her one-third of 1 c.c. of pituitrin and she had her baby in about twenty minutes after that without having any laceration or any trouble. She had a good night, and I saw her the next morning at about 11 o'clock. Just before I arrived, she complained of some pain through the shoulders and while I waited she was completely paralyzed from the sixth cervical vertebra down. Dr. Spiller saw her in consulta-

tion. The Wassermann tests of her blood and spinal cord and of her husband's blood were negative, and Dr. Spiller said he supposed probably the pituitrin had something to do with it, possibly in some way causing a thrombosis in the vertebral artery, which I think was about as far as we could ever find out. Of course it came on too soon after labor for infection from the uterus. She lived about six weeks and never recovered any sensation. She breathed entirely with the phrenics and diaphragm. There was no postmortem permitted.

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## GEORGE ERETY SHOEMAKER, M.D.

JANUARY 5, 1922.

In the death of Dr. George Erety Shoemaker, the Philadelphia Obstetrical Society has suffered a great loss. Dr. Shoemaker had been a member of this Society for thirty-three years, having been elected in 1887. His active interest in our scientific business is well attested by his frequent contributions to our transactions, as well as by his regular attendance at our meetings during many years. The last paper ever prepared by him was to have been presented to us last month, but his death occurred very suddenly upon the day of the meeting.

In view of Dr. Shoemaker's long service in the halls of the Obstetrical Society, it is fitting that commemorative action be taken and therefore, your Committee offers the following:

"WHEREAS, in the death of George Erety Shoemaker, the Obstetrical Society of Philadelphia has lost an active and enthusiastic member of high ideals, broad charity, and matured attainments; therefore, be it resolved, that a copy of this minute be sent to the family of the deceased, as a manifestation of our sympathy in their bereavement and that it be spread upon the minutes of the Society as a mark of our respect and sorrow."

WM. R. NICHOLSON,  
JOHN H. GIRVIN,  
COLIN FOULKROD.

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## NEW YORK ACADEMY OF MEDICINE SECTION ON OBSTETRICS AND GYNECOLOGY

STATED MEETING, MARCH 28, 1922

DR. WILLIAM P. HEALY IN THE CHAIR

DR. A. J. RONGY reported a case of **Fibroma of the Ovary Complicating Pregnancy.**

Mrs. H., admitted to the Lebanon Hospital, Feb. 3, 1922, twenty-two years of age, white, married, primipara, born in Russia. I was called to see her in consultation during labor, and found a thick, conical cervix dilated about one and one-half fingers. In addition I felt a hard, irregular tumor obstructing the lower three-quarters of the pelvic outlet. The tumor had the general consistency of an exostosis. A cesarean section was done after which I removed the tumor which was

very hard, originating in the ovary and having a pedicle consisting of a sheath containing parovarian structures. The lobular tumor measured 15x9x5 cm. There were two distinct parts seen on section, an outer zone measuring 3 cm., hard and solid, and an inner cystic area. There were no gross evidences of an acute inflammation. On cross section, the pedicle showed three zones: an inner whitish zone similar to the tissue of the tumor, a middle mucoid zone, and an external thin tunica which limits the pedicle. This latter is apparently composed of connective tissue. Microscopically, some areas show nothing but firm connective tissue. Other sections show pictures similar to that of pedicle. One area shows a definite corpus luteum cyst. No evidences of malignancy. Microscopically, the pedicle presented an external zone of connective tissue cells making a rather definite tunica. Within this there was a loose structure of fibroblastic cells. Throughout this section there are numerous small cystic areas, a few lined with a deep layer of irregularly arranged epithelial cells. The nuclei of these cells are poor in chromatin. Some cysts are lined with a zone of connective tissue very poor in cellular elements. Tissue is rather sparse in blood vessels. Diagnosis: Fibroma of ovary.

I present this case to the Section for the purpose of evoking a discussion as to the proper procedure to follow in a case of tumor complicating pregnancy at term. Shall we remove the obstructing tumor and perform cesarean section or shall we simply remove the tumor and allow the patient to deliver *per via naturalis*?

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### DR. RONGY also reported a case of **Hernia of the Pregnant Uterus with a Fourth Cesarean Section.**

Mrs. L., admitted to the Lebanon Hospital, Oct. 20, 1921, thirty-five years of age, white, married, primigravida. Her gestation period at the time of admission to the hospital was seven and a half months. She presented a very marked median ventral hernia, through which the gravid uterus protruded covered only by skin and subcutaneous fat. The skin had given way in the upper part of the hernia with a resultant ulcerated and granulating area. The patient was put to bed immediately on admission but despite all treatment the ulcerated area increased in extent. I had previously performed three cesarean sections on this patient. She refused to be sterilized always hoping that the next child would be a boy. I waited until term and performed the fourth cesarean section, sterilized her and repaired the hernia. Patient made an uneventful recovery.

The reason I present this case is to get the sense of the members of the Section as to the best procedure. Should this woman have been aborted in the early months of pregnancy or should her case have been managed as it was?

### DISCUSSION

DR. EDWARD W. LEE.—I think no adverse criticism can be made on the procedure in the first case.

So far as his second case is concerned, I believe that woman was entitled to have her uterus emptied. She must have had wonderful care to have gone through so much, with the hernia and ulcerated abdominal wall. I condemn his procedure of allowing her to go through so much suffering, and I think Dr. Rongy should have emptied her uterus.

DR. FREDERICK C. HOLDEN.—I believe that in such cases the course to be followed depends on: (1) the condition of the patient; (2) the condition of the child, and (3) the amount of dilatation of the cervix. I cannot see any reason

if the woman is in good condition and the child in good condition, why it is necessary to do a cesarean section. I think one must be governed entirely by individual circumstances in each case. As for the second case, I think that when a woman has had two cesarean sections she is entitled to sterilization.

DR. HEALY.—It seems to me the results in these two cases justify the procedures carried out by Dr. Rongy.

In regard to the second case, I should have disliked to induce an abortion just because the patient had a hernia of the uterus through the abdominal wall. I think that Dr. Rongy's method of procedure was the proper one. He took good care of the patient and showed that a woman could be carried through pregnancy and could then be cured of her hernia, and therefore an abortion would not have been justified. I think, as Dr. Holden says, that the woman should have been sterilized by ligating the tubes at the time of the cesarean section; but to interrupt pregnancy would not have been justified.

DR. RONGY.—In reply to Dr. Holden, I would say that in this case the cervix was just beginning to dilate; one could not tell how long it would take the patient to complete her first stage. Therefore I felt that it would not be advisable to allow the woman to go through her entire labor, immediately following a serious abdominal operation, and I incised the uterus and removed the child. The only objection to an abdominal delivery, in a case of this kind, is the scar in the uterus. However, weighing both questions in my mind at that time, I decided in favor of the latter.

As to sterilization: many women are prejudiced against sterilization; there is a notion among some of them that if they are sterilized, they become sexually unfit, and it is more on this account that they object than because they will not be able to bear any more children. I agree with Dr. Lee that fat women particularly, who have had two or three cesarean sections, should not be subjected to repeated operations. These women should be told of the danger and some of the complications that may accompany multiple sections.

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#### DR. HENRY FURNISS reported a case of **Supernumerary Ovary**.

This patient, thirty years of age, was seen on April 25, 1921. Menstruation began at the age of thirteen, of the four-weekly type, five days' duration, always attended by crampy pains in the lower abdomen, and was profuse until she was twenty-five; since then the flow has been moderate.

When eighteen years of age she began having pain in the lower abdomen, in the center and the right side. At first this came every four weeks, lasting a day or two, but not at the menstrual period. During the past year the pain had become worse, and for three months had been severe and almost continuous. In December, 1919, she had influenza pneumonia, and since then has been rather frail.

Examination showed a mass the size of an orange in the pelvis, posterior to the uterus, cystic and very tender.

On April 30, 1921, a median abdominal incision was made. A mass 10x7x3 cm. was found, attached by a pedicle, one-eighth of an inch thick by three-fourths of an inch broad, to the upper posterior surface of the uterus, just internal to the tube, and adherent to the culdesac. This was removed by division and suturing of the pedicle. Two normal ovaries, normally situated were found. Recovery was uneventful.

*Pathological Report:* A rather thick-walled cyst contained chocolate colored, broken down, opaque fluid material. The wall is from 5 to 12 mm. in thickness and appears to consist of edematous fibrous tissue. On further sectioning, serous cysts, from 5 to 8 mm. in diameter were discovered in the substance of the wall. Sections of the cyst wall show in part a lining of columnar cells covered with blood clot at certain points and in part, denuded areas with the exposed stroma filled with blood pigment. The wall is dense, fibrous tissue infiltrated with round and polynuclear cells beneath the epithelium. It is somewhat edematous; contains large blood vessels; many small capillaries with round cell infiltration about the vessels and polynuclear cells in the lumina of many. Blood extravasation and blood pigment is common in the wall. There is a small cyst in the wall lined by several layers of flattened cells that seems to be a dilated graafian follicle.

*Diagnosis:* Ovarian cyst showing chronic inflammation and degeneration with small cysts in the wall.

This is a true case of third ovary with cystic degeneration.

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### DR. HARBECK HALSTED reported a case of **Morphine Poisoning of the Fetus Before Delivery.**

This case is of interest because it is one of profound poisoning in the infant from morphine administered to the mother before delivery, followed by recovery after treating the infant along the lines advocated for morphine poisoning in the adult.

The mother was colored, eighteen years of age, a primipara. The probable date of confinement was Feb. 2, 1922. The patient was first seen in the prenatal clinic Dec. 12, 1921. At that time she gave a history of vomiting twice early in pregnancy, none since. Her appetite was poor; she was constipated; and complained of occasional headache and slight burning on urination.

She was seen in the antepartum clinic at regular intervals. Her blood pressure was never above 118/65 and her urine was negative. The diagonal conjugate was 10 cm.

On January 24, 1922, she was admitted to the Sloane Hospital for observation. A consultation was held and a cesarean section considered as probably the best method of delivery. She developed a cold with a cough so the operation was postponed from time to time waiting for it to clear up. By some oversight the blood pressure was not taken and the urine was not examined at regular intervals. During the night of Feb. 13, 1922, she was wakeful and the morning of the fourteenth complained of a severe headache. She was given aspirin 5 gr. at 2:30 A. M. and again at 11:45 A. M. Feb. 14 she had a profuse bleeding from her nose, vomited some old blood and complained of severe headache, dizziness, and spots before her eyes.

On examination she was found to be very toxic, nervous, to have edema of the legs, reflexes markedly exaggerated; her blood pressure had risen to 142/80 and her urine showed albumin .607 by gravity. It was decided to put her on routine treatment for marked toxemia, which is to keep the patient deeply under the influence of morphine in addition to other treatment.

It was also decided that as soon as the patient was well morphinized a cesarean section should be done as the only method of delivery holding out any hope for the baby.

She was put on a low protein, salt-free diet, forced fluids and absolute rest in bed. At 12:10 P. M., Feb. 14, she was given morphine sulphate  $\frac{1}{4}$  gr. by hypoder-



mie; at 8:30 P. M. chloral hydrate gr. XX and sodium bromide gr. 15 was given per rectum. At 11 P. M. she had another epistaxis which lasted ten minutes and was followed by the vomiting of old blood. At 2:15 A. M., Feb. 15, morphine gr.  $\frac{1}{2}$  by hypodermic was given. At 3:50 A. M., she vomited a small amount of coffee ground material. At 4 A. M., morphine gr.  $\frac{1}{4}$  was given by hypodermic. At 5:20 A. M. the patient coughed up clotted blood and vomited a dark red fluid. She rested fairly quietly after 2:30 A. M. At 9:05 A. M. she vomited dark brown fluid and was given gr.  $\frac{1}{2}$  by hypodermic. At 10:05 A. M. she was again given morphine  $\frac{1}{4}$  gr. by hypodermic. She was also given a colon irrigation. At 11:05 respirations were 11 per minute; at 12:45 P. M., respirations had fallen to 6 per minute. At 2:55 P. M. she was delivered by cesarean section of a baby girl weighing 3629 grams.

In all our previous toxic cases treated with large doses of morphine the effects had apparently worn off during labor. The baby's heart was normal but it was hard to get her to breathe. After about thirty minutes of tubbing in hot and cold water with artificial respiration the baby cried, but on arrival in the nursery a few minutes later she was very blue, the respirations were very shallow and had nearly ceased; when spanked and aroused the color and breathing immediately improved. Oxygen was administered but did not seem to do much good. As soon as the baby was left alone she became cyanosed, the respirations slow and shallow and once ceased entirely; this time she was given a mustard bath which again revived her. During this bath, about an hour after birth it was noticed that the pupils were pin point and that the respirations reacted to stimulation as in morphine poisoning. It was determined to treat the baby as an adult who was so poisoned. Atropine sulphate, gr.  $\frac{1}{600}$  per hypodermic was repeated twice at three-hour intervals. About ten minutes after the first dose of atropine, adrenalin 1-1000, min. 3, and caffeine citrate, gr.  $\frac{1}{3}$ , hypodermically; gastric lavage with potassium permanganate solution about 1-100,000. Coffee ounces one per rectum.

It was necessary to arouse the baby at frequent intervals for nearly eight hours and a second mustard bath was necessary about three hours after birth. For three days after birth the baby vomited after each feeding and even vomited after gavage—probably as an after result of the morphine poisoning. After the first three days the baby's progress was normal.

### DISCUSSION

DR. HARRY ARANOW.—While I have never seen a case of morphine poisoning in a baby to the extent of that reported by Dr. Halsted, I have seen many infants slightly affected by narcotics administered to the mother. When we worked with "twilight sleep" some years ago I saw children born with pin point pupils and partly narcotized. In the majority of the cases the influence of the morphine gradually wears off without the adoption of any very drastic treatment. The mother in this case I believe was not excreting her morphine in a normal way as is indicated by the fact that her respirations kept going down. She retained the morphine for more than four hours.

DR. ROYAL C. VAN ETTEN.—We have in ordinary cesarean sections done away with the use of morphine and atropine before operation. For a long time we have noticed that the babies taken from mothers who had these previous injections, which were within one-half hour before anesthesia was started, did not do so well.

DR. HOLDEN.—Several years ago I did a cesarean section for dystocia. She was given 1 grain of morphine. The baby was somewhat narcotized and became

very cyanotic, so that it could not be left alone. We placed a small rubber catheter in the baby's nose and held it in place with adhesive plaster, and administered oxygen. The irritation of the catheter and the oxygen was all the baby needed. After twenty-four hours the catheter was removed.

DR. HALSTED.—We tried to give oxygen in the ordinary manner, but the baby did not breathe or the breathing became very shallow and at one time stopped altogether so the oxygen was not absorbed. The interesting point is the fact that we treated this baby exactly as the text-books recommend treatment for adults and with success.

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**DR. SINCLAIR TOUSEY reported a case of Fibroma of the Uterus Cured by Deep X-Ray Therapy. No Return of Tumor in Three Years.**

The patient Mrs. D. referred by Dr. T. Spenser Halsey about four years ago, was extraordinarily large but refused to be weighed, and was 38 years old. She had had a fibroid for 4 or 5 years, abdomen somewhat enlarged. She had very severe hemorrhages, from which she was sometimes almost exsanguinated and on various occasions packing had been employed. She had a weak heart and was very nervous. She had been treated with radium, seven hours, at one of our best institutions, but this had not caused her to miss even one period. The details of the radium treatment follow:

“May 1st, 1918, radium was inserted into the uterine canal for 677 mc. hours, screening being 1 mm. platinum and 1 mm. rubber. May 30, 1918, she was given an external treatment over the tumor at a distance of 4 cm., area covering 30 square cm., screening  $\frac{1}{2}$  mm. platinum, for 3100 mc. hours.”

There was a fibroid as large as a grapefruit of the body of the uterus and two in the cervix the size of walnuts were visible with a speculum, as well as palpable.

All the x-ray treatments were with my own generator which delivers a constant, unidirectional voltage at the terminals of the x-ray tube, the result being a stream of cathode particles starting under the influence of a uniform voltage, the object being to secure x-rays of approximately the same velocity, which many different tests have shown is approximately the case. So that with a comparatively light filter, thereby wasting only a comparatively small part of the radiation, I am enabled to produce a sufficiently deep effect, usually without even reddening the skin.

Wintz and Seitz have not had the opportunity to employ such a constant current but state their belief in it. Their own work has been done with a voltage of 160,000, consisting of a series of waves from a very low to a very high voltage. They agree that the very high voltage does not generate any x-rays of greater penetration than the more penetrating rays generated by moderate voltages of the ordinary impulsive type. But the higher the voltage the greater is the percentage of the more penetrating rays. Comparative tests have shown that with the ordinary type of generator even 160,000 volts do not give as great a percentage of the more penetrating rays as a constant current with 95000 volts.

The applications in this case illustrate the effects of different doses of radium and the x-ray in this condition in a large woman with a fibroid as large as a grapefruit. 677 millicurie hours intrauterine had no effect, neither did 3100 millicurie hours externally.

Of my own x-ray applications the first consisted in 10 minutes, 83 kilovolts, 3 ma., 10 inches, 3 mm. aluminum over each of six areas, *a*, upper, *b*, lower part of right lower quadrant of the abdomen; *c* and *d*, upper and lower part of left lower quadrant of abdomen; *e* and *f* right and left sacral regions. This was followed by amenorrhea lasting one year. The next series was as follows: the same areas as above except that the four quadrants of the hypogastrium received an additional dose a month later. Besides this the voltage was 87 thousand instead of 83 thousand. The time of exposure was the same except that for each of the two sacral areas it was only 5 minutes instead of 10, and for these the filter was 1/5 mm. instead of 3 mm. aluminum.

After this series given in May, 1919, there was immediate and complete amenorrhea and complete disappearance of all the fibroid tumors. The patient felt much less nervous than before. A couple of years later she was married again and

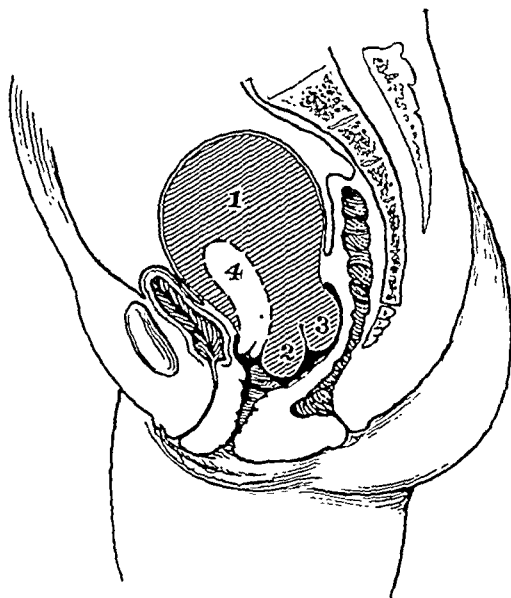


Fig. 1.—Diagram showing 1, fibromyoma of uterus; 2, 3, tumors visible with vaginal speculum; 4, uterus of normal size. Tumors and hemorrhage cured.

found she had normal sexual desires and gratification. Three months later she was terrified to find perfectly normal menstruation occurring. There was no recurrence of the fibroid tumors but the fear of a return of the dreadful hemorrhages made her very nervous. I persuaded her to wait for another menstruation but then she said she was leaving for the country and Dr. Halsey and I both felt that another course of treatment with a possibility of again producing amenorrhea would be preferable to the terror she was laboring under.

At this time the treatments were with a 10-inch spark, 2 ma. 3 mm. aluminum, 11 inch distance, four areas in front and two behind treated for 10 minutes each, avoiding a part of the right sacral region where an almost imperceptible net work of cutaneous vessels outlined one of the previous x-ray applications.

The treatment at this time was not given because of any return or prospect of return of the tumor or hemorrhages but simply because of the patient's absolute terror.

## DISCUSSION

DR. EDWARD W. LEE.—I know that you will criticize me, but I cannot understand why that woman was not operated upon. Here were three fibroid tumors, one as big as a grapefruit and why was she treated with radium and x-rays when even in ordinary hands, hysterectomy is so very satisfactory? I have performed many hysterectomies and I have yet to be persuaded that radium and x-rays are the treatment when even in ordinary hands hysterectomy is such a safe and sure procedure. I will not go into the possibilities of the presence of malignancy in connection with fibroids, but here was a case treated indefinitely and she does not know whether she will have to return for further treatment.

DR. TOUSEY.—This report was not intended to show which cases should be selected for radium, which for x-ray treatment, and which for operation. It was simply to report a case selected for this form of treatment on its own merits. From the size of the tumor it was not adapted for radium treatment but proved to be favorable for x-ray therapy.

An operation either from viewpoint of the work and expense required by the surgeon and nurses or from the viewpoint of the patient's suffering and disability is a very different matter from forty-five minutes' x-ray treatment on three occasions in four years.

Dr. Van Etten in his paper referred to Dr. Kelly's statement that in young women with severe hemorrhage he preferred to curette twenty times rather than to use radium. The reason Dr. Kelly made that statement was not that the radium was not effective in controlling the hemorrhage but because it might sterilize the patient and interfere with sexual functions.

*(To be continued in the August issue.)*

## ST. LOUIS GYNECOLOGICAL SOCIETY

MEETING OF FEBRUARY 23, 1922

DR. E. LEE DORSETT, CHAIRMAN

DR. HUGO EHRENFEST presented a paper entitled **Better Obstetrics and the Problem of the Birth Injuries of the Newborn Infant.** (For original article see page 61.)

## DISCUSSION

DR. GEORGE GELLHORN.—This paper has made me realize how little attention, on the whole, I have paid to the subject of birth injuries and how many problems of practical obstetrics should be viewed from this new angle. The grosser, more obvious, traumatisms we have always taken into consideration. I add to Dr. Ehrenfest's list the cases of torticollis of which I have observed two within the last year. One was a true torticollis, due, probably, to a persistent faulty attitude of the fetus *in utero*. An asymmetry of the face further testified to the congenital origin of the anomaly. The other case was one of pseudo-torticollis caused by an hematoma into the sternocleidomastoideus muscle during the breech extraction of a very large child. Complete restoration was obtained in both cases.

DR. L. M. RIORDAN.—It will be interesting to mention in this connection the result of postmortem examinations made in Dr. De Lee's service at the

Chicago Lying-in Hospital. We discovered injuries of some sort in about 70 per cent of all the necropsies, of which between 40 and 50 per cent were brain lesions.

DR. FRED J. TAUSSIG.—I will ask Dr. Ehrenfest to answer a few questions: Would a systematic radiographic examination of the newborn seem desirable? Are the methods of ascertaining the clotting time simple and accurate enough to be extensively employed? With the fetal head deep in the pelvis, would forceps or pituitrin seem more preferable?

DR. PERCY H. SWAHLEN.—I think that many other causes, especially syphilis, are more likely to be responsible for idiocy and other mental defects than a birth injury. In one of my cases, a forceps extraction, the larynx had been injured by a cord tightly coiled around the neck. The condition was considered an asphyxia and the efforts at resuscitation naturally proved a failure.

DR. OTTO SCHWARZ.—The babies' ward of the obstetrical department of the Barnes Hospital is daily visited by a member of the pediatric department. The determination of the blood clotting time is a routine carried out on every newborn.

DR. R. E. WOBUS.—Unnecessary haste apparently is one of the more common causes of serious injury of the infant. A radiographic routine examination of the newborn, as suggested by Dr. Taussig, would imply a definite danger since it would mean too large a dose of rays, but certain regions, supposed to be injured, could be easily studied under x-rays. As regards cranial indentations and fractures it would seem the safe rule to operate whenever symptoms of an intracranial hemorrhage are evident.

DR. HENRY STORRS.—Is there any connection between cephalhematoma and intracranial hemorrhages?

DR. RANDALL S. TILLES.—I wish Dr. Ehrenfest would explain why he assumes a relation of twilight sleep to intracranial lesions.

DR. EHRENFEST (closing).—It would be impossible to answer all the questions I have been asked. This would take more time than I devoted to my paper written for the purpose of awakening in you, as obstetricians, appropriate interest in two features of the problem of the parturitional injuries of the child, their prevention and early detection.

Haste is a significant factor in their causation, and especially if this haste leads to the quick and forced compression of the head. The expulsion may be dangerously hastened by a large dose of pituitrin, by the application of the forceps, or by too quick an extraction of the aftercoming head in the unjustified fear that otherwise the child would succumb to the compression of the umbilical cord between skull and pelvis. These are the most common conditions which supply the one factor of quick compression of the head. The other element, that of excessive compression, is furnished by a pelvic contraction, by a faulty technic in the extraction of the advancing head by means of the forceps or of the aftercoming head in a breech labor if the operator fails to bring, in accord with the mechanism of labor, the various diameters of the head in proper relation to certain pelvic diameters, because even in a normal pelvis, too large a head diameter is forced through relatively too small a pelvic diameter. Excessive compression of the small but soft head of the premature infant might be accomplished by its forced passage merely through an incompletely dilated cervix or rigid vulvar ring. The intracranial injury may be slight and again it will be haste in resuscitation which will be the cause of further traumatization, aggra-

vating the primarily slight intracranial lesion and adding other injuries. In the practice of obstetrics surely experience should result in less haste and more deliberation.

In our present state of information concerning the causation of intracranial injuries the choice between pituitrin and forceps should be determined by the decision in the particular situation whether the one or the other is less likely to cause either a quick or an excessive compression of the head, and under such conditions a liberal episiotomy or a preliminary ironing out of the vagina, as taught by Potter, might eliminate a definite danger to the child.

At least for theoretical reasons twilight sleep is objectionable as far as injuries of the child are concerned, because it delays the second stage of labor, very often leads to the necessity of employing pituitrin, probably in 85 per cent of the cases requires termination of the labor by forceps, and in a considerable number of cases makes artificial respiration necessary, all factors of recognized significance in the causation of intracranial injuries. In individual reports of cases one meets often with the assertion that "twilight sleep" was more or less directly responsible for the fatal injury. Some neurologists predict that it will take many more years to realize all the damage done to the baby's brain by "twilight sleep." Personally I feel that in some cases, in which the obstetrician uses enormous doses of morphin and scopolamin to keep the given promise that the patient will feel no pain, aside from a possible mechanical injury, a chemical injury might also be inflicted on the infant.

Rodda's method of ascertaining the blood clotting time is not accurate but simple, and entirely adequate for practical purposes. Whenever this simple test only suggests a delay of clotting it will always be advisable to resort to the entirely harmless procedure of injecting whole blood of father or mother subcutaneously. This is not only in itself a very good curative procedure but of great prophylactic value if further symptoms should make surgical interference necessary.

Radiographic study of a certain region is requisite for the correct diagnosis of certain injuries, e. g., fracture of the clavicle, differentiation between brachial palsy and detachment of the upper epiphysis of the humerus, or recognition of an injury of a cervical vertebra which may only simulate a torticollis, etc.

# Department of Reviews and Abstracts

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CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

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## Collective Review

### The Kidney of Pregnancy

BY EDGAR F. SCHMITZ, M.D., ST. LOUIS, MO.

IN REVIEWING recent literature on the so-called kidney of pregnancy, with its associated conditions of edema and hypertension, one is struck by the variety of classifications of kidney disease encountered, and the rather confusing nomenclature employed. For our purpose it is not essential to minutely examine the foundations on which these various overlapping and often conflicting divisions of pathology and symptomatology are based. It will suffice here to bring out the more salient points of those facts which seem fairly well established.

In studying renal involvement during gestation one must necessarily differentiate a true nephritis from those nephropathies under discussion, for upon this differentiation depends our future attitude on what may be called the kidney of pregnancy. Any case in which renal changes appear prior to conception cannot strictly be classed with the type of disease under discussion, even if the symptoms are aggravated by the subsequent impregnation. Nor should a case in which permanent renal damage is found following delivery be placed in this category, for v. Leyden long ago pointed out that one of the characteristics of the true nephropathies of pregnancy is the rapid disappearance of all symptoms following the emptying of the uterus by natural or artificial means. Heyneman<sup>10</sup> and others have recently again emphasized a point in differential diagnosis, by calling attention to the fact that the kidney of pregnancy is manifestly based primarily on degenerative processes, while a true nephritis is primarily of inflammatory origin. It is true that borderline types will be encountered now and then, where it will be difficult to determine which condition dominates the clinical picture, but in the main the kidney of pregnancy does not show the changes found in nephritis.

The newer views on this subject are taking a much broader interpretation of the symptom-complex exhibited, and have followed the line of reasoning so ably stated by Atchley<sup>1</sup> in the concluding paragraph of his article, in which he says, "One must express the feeling that the investigation of this disease (nephritis) has been hindered by an interest too closely restricted to the kidneys. A broader study of the chemical balances of the body as a whole may demonstrate that the kidney is of secondary importance, both from an etiologic and pathologic standpoint."

Working along these lines many new and interesting avenues of investigation have been opened by workers the world over. Eckelt<sup>5</sup> found that in those cases exhibiting moderate degrees of intoxication, with albumin, edema and hypertension, there was no nitrogen retention. Losee and Van Slyke<sup>13</sup> showed that in the kidney of eclampsia there was neither marked nitrogen retention, nor severe acidosis, and concluded from this that the toxemia is not a uremia. Zangemeister<sup>16</sup> in his rather exhaustive work on this subject demonstrated that although a definite retention of sodium-chloride occurred in the body during the edemas of pregnancy, the total percentage of all salts excreted in the urine was still relatively high, which proved that no marked insufficiency for salt elimination by the kidney existed. He further showed that in the early stages of the disease there was no functional disturbance in the water output of the renal parenchyma, oliguria occurring only as a later development.

The pathologic picture of a degeneration, the lack of nitrogen retention, the relatively unimpaired salt elimination, the clinical observation that the nephropathies of pregnancy tend toward a spontaneous cure after delivery without causing permanent renal changes, force one to the conclusion that the renal pathology is not responsible for the symptom-complex, that the kidney is not primarily involved, that its function is not seriously impaired until late in the disease, that the changes which occur are of a secondary nature, and that we must look elsewhere for a causative factor rather than cling to the older ideas which are no longer tenable.

The development of the Micro-capillary Tonometer by Danzer and Hooker<sup>4</sup> has given a new impetus to the study of extrarenal factors in all pathologic kidney conditions, especially those connected with pregnancy. It is now possible directly to observe over long periods of time the individual capillary and its tiny blood stream, and to accurately check any deviation from the normal which may exist. Using modifications of this technic, various observers have brought to light some interesting and instructive observations. Working with the capillaries under the finger nail, they showed distinctive changes in both the vessel wall and its fluid contents, in the various degrees of intoxication, found associated with the kidney of pregnancy.

Hinselmann,<sup>9</sup> investigating those cases showing evidence of hypertension, was able to demonstrate a distinct spasm in segments of the capillary wall with a resulting dilatation in other portions of the tube. He was able to observe the contents of the capillaries stagnate with each contraction, the color of the blood gradually changing from red to blue, and in the worst cases all flow ceasing. When relaxation occurred and the flow became reestablished or strengthened the blood again changed color, this time the blue giving way to a normal red, and the overdistention becoming less marked. He found these spasms to be intermittent in character, and their duration and frequency bore a direct relation to the severity of the symptoms. In one very marked case there was complete stagnation for 65 per cent of the time the patient was under observation. An interesting point to be noted is that following delivery the spasms became fewer and of shorter duration, that the overdistended portion of the capillary gradually returned to its normal caliber and that coincident with these changes, the blood pressure began slowly to fall. The same result was obtained, but to a



lesser degree, following appropriate treatment, which will be discussed later. Hinselmann concluded from these findings that the capillary spasm found in the skin was only a part of a generalized vessel contraction throughout the body, and thus gives some support to those investigators who have long held that the kidney changes found in pregnancy are due to a spasm of the blood vessels in the glomeruli.

Nevermann<sup>14</sup> comparing the capillary action in the pregnant and nonpregnant state found that no difference existed, normal gestation evidently causing no change in this portion of the vascular system. As soon, however, as any symptom of an intoxication entered the clinical picture, the findings became abnormal with a resulting stagnation of the capillary blood and a dilatation of the vessel wall. He further showed that venesection with the removal of 300 to 500 c.c. of blood improved the capillary circulation, decreased the number and duration of the spasms, produced a better interchange of blood, and symptomatically seemed to be of benefit to the patient. All of this occurred, however, with a fall in blood pressure of only 20 or 30 mm. of mercury. This observation fits in nicely with the work done by Krogh,<sup>12</sup> who found that capillary tension did not depend on blood pressure, but on the tonus of the capillary wall, and that if stasis existed in the capillary the tonus suffered.

At this time it seems fairly well established that a rise in blood pressure is due to a diminution in the caliber of certain portions of the vascular system, the result of a contraction or spasm of the vessel walls. The causative factor of this spasm is still clothed in utter darkness, which up to the present has defied all attempts at clarification. Some consider it as a part of a general toxic condition associated with pregnancy, but Bumm has shown that one may inject as much as 1000 c.c. of blood from a toxic patient into a nontoxic one and cause not the slightest disturbance. Gessner emphatically denies the existence of a toxic substance circulating in the blood, and points out that any poison which acts over a period of weeks or months must cause changes in the interstitial tissue as well as in the blood vessels. Such changes are not found in the nephropathies of pregnancy, the pathology here being essentially that of a nutritive disturbance of the secreting cells.

The question of edema in pregnancy has from time immemorial been much associated with changes in the kidney substance and only in recent years have we got away from the old dictum, and advanced into a newer and broader understanding of this complicated condition. Zangemeister<sup>15</sup> considers the primary cause of edema to be due to some extrarenal factor which produces a change in the lining of the capillary wall with a resulting transudation of fluid into the tissue. This conception is held by many other investigators, and perhaps typifies the most prevalent attitude of present-day observers. Fink,<sup>6</sup> however, in his rather interesting observations on the causation of edema, sharply attacks this theory, and suggests some very plausible arguments based on the newer conception of the nature of colloids and the laws of osmosis. High blood pressure artificially produced, he maintains, has never caused an edema to manifest itself, even if the vessels were greatly overdilated with fluid, and points out that the interchange of liquid from vessel to tissue is not to be looked upon as merely a filtration process. Edema is not essentially the result of a

kidney involvement, but in this conception depends rather on the quantitative relationship of the organic and inorganic substances in the body to the physiologic processes of the tissue cell. If this relationship is disturbed, molecules and electrones of various substances, ingested or produced by metabolic changes, are set free in the body in excess of cell requirement, and become temporarily stored in various organs, especially the subcutaneous tissue. If the individual cell groups are unable to dispose of these products by speedy elimination they become fixed in the tissue and thus the body colloids are placed in a state where water absorption becomes imperative. We have, therefore, in pregnancy, edemas becoming manifest as soon as a disturbed relationship exists between the molecules presented to the organism by the metabolic processes of both mother and fetus, and the ability of the maternal cells to properly rid themselves by elimination of these excess substances. Fink<sup>6</sup> is in agreement with those authorities who state that edema is responsible for the kidney changes in pregnancy, but differs with them in his conception of the *modus operandi* by which the pathology is produced. He contends that the process is mechanical rather than toxic, that the colloids of the renal parenchyma absorb fluid because of the excess of unused molecules stored in the cell, that the resulting swelling causes pressure to be exerted on the capillary blood supply with interference in the circulation and consequent cell damage, producing albuminuria and cast formation. He considers edema not as a water retention following kidney changes, but water retention with kidney changes, the causative factor of which lies outside the urinary apparatus.

From the brief summary of the literature here presented it will be apparent that the kidney is no longer looked upon as the chief factor in the production of those symptoms which we have come to recognize as part of the picture of the kidney of pregnancy. Most investigators are agreed that the actual changes in the renal parenchyma are secondary, depending upon some extrarenal factor, the nature of which has not as yet been definitely established. The first essential, therefore, in outlining a rational therapy for this class of cases, is an accurate diagnosis, which takes into consideration the possibility of a primary kidney involvement aggravated by pregnancy. Where this unfortunate complication can be ruled out, the treatment as outlined in the following paragraphs would seem indicated.

All authorities are agreed that rest in bed is the treatment *par excellence* for the nephropathies of pregnancy, for by this simple measure the extra work, incident to the erect posture, is taken from the capillaries; the heat regulation becomes simpler, a more even body temperature resulting; less muscular and nervous energy is expended, and the quantity of food and liquid necessary to maintain proper nutrition can be much reduced.

The diet should be bland, avoiding those substances which tend to produce a rise in blood pressure, as spices, coffee and alcohol. Protein and fat can be reduced to a total intake of 60 or 70 grams per day, as the experiences of the Central European countries during the war, when these substances were not easy to procure, demonstrated the advantage of these low figures, in the decrease in the number of severe intoxications recorded. Salt must be restricted to a minimum in any diet prescribed for patients suffering from this condition, as we know

that sodium chloride is retained in the tissues and predisposes to the formation of edema. Liquid intake must be cut down to such a quantity that the body is not overburdened by an excess of fluid which cannot be properly eliminated by the kidneys. A good working rule which may be of service in properly adjusting the amount of liquid ingested is to give only as much fluid per mouth in 24 hours, as the amount of urine excreted in the same time.

From what has just been said it will be apparent that a milk diet, as formerly prescribed, is not suitable for these cases, as milk contains too much water, increasing the fluid intake above the desired amount, and too much salt and protein to come within the required limits. We must rely on carbohydrates to supply the deficiencies in the reduced values of other foodstuffs, and keep up the body weight by a generous supply of such substances as rice, flour, potatoes and sugar, etc.

In those cases which show no improvement under the treatment outlined or where preeclamptic symptoms begin to manifest themselves, special measures must be adopted, the most important of which is venesection. We have seen that the mere taking away of a relatively small quantity of blood is of immense benefit in reestablishing the capillary flow and reducing the angiospasm which are so prominent a factor in this disease. It is, therefore, advisable to take from the circulation 300 or 500 c.c. of blood whenever the indication arises, and to repeat this procedure at short intervals until the desired result is obtained.

The question of the termination of pregnancy is one which hardly comes within the scope of this review, inasmuch as we have limited ourselves to the consideration of the kidney of pregnancy *per se* without taking up either eclampsia or true nephritis. It is selfevident that where no improvement can be brought about after a prolonged trial of the above mentioned measures, and where with the most careful attention the patient rapidly becomes worse, the uterus must be emptied.

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## Book Reviews

**The Place of Version in Obstetrics.** By IRVING POTTER, M.D., F.A.C.S.  
C. V. Mosby Co., St. Louis, 1922.

This monograph containing a foreword and seven chapters, deals successively with the History of Version, the Present-day Employment of Version, the Author's Technic of Version, besides some twenty-three pages devoted to Criticisms and Answers, Indications and Advantages, and statistical reports for the years ending August 31, 1920, and 1921, with conclusions drawn therefrom.

In the foreword Dr. Potter defines his position in reference to the performance of version, when he states, that, "from an experience extending over many years of practice, including thousands of personally conducted cases of labor, I have come to believe that it is justifiable to perform a podalic version for the purpose of eliminating the second stage of labor and relieving the woman of the pains and agonies of childbirth, since such a procedure in my hands has been attended with no increase of fetal mortality and has had a lessened maternal mortality and future morbidity."

After reading this little book, one cannot help being impressed with the fact that the practice of obstetrics in Potter's hands divides itself into version and cesarean section, interrupted by an occasional spontaneous delivery occurring before the arrival of the attendant. That this is radicalism does not admit of argument.

One is further impressed with the fact that the women of Buffalo are physically and psychically different from those found in other parts of the country, in that they apparently do not suffer pain during the first stage of labor. For the parturient elsewhere, the stage of dilatation is often the most prolonged, painful and tedious part of the labor, the one that exhausts and is not forgotten, for the second stage in modern practice can be and is made relatively painless by the use of analgesia and anesthesia. Hence the principal indication for version as set forth by the author, i.e., to eliminate the pain of the second stage of labor, fails to relieve the woman of the agonies of childbirth.

The forty odd pages describing the author's technic in version are well written and illustrated with many explanatory photographs and drawings. This chapter should be carefully read and the details contained therein applied in the practice of every obstetric surgeon. The importance of skilled anesthesia to secure proper muscular relaxation and the employment of the modified Walcher position are practical points of no little significance.

Furthermore, credit must be given to Potter for what he has done for obstetrics in perfecting the technic of internal version and extraction, for in this book he has presented to us a logical succession of steps, based on the fundamentals, that is an improvement on all former procedures.

After reading every sentence of this monograph we are as yet in ignorance as to why version was performed 920 times in 1113 deliveries in 1920 and 938 times in 1130 deliveries during 1921, unless it was for the convenience of the operator or on that questionable indication, eliminating the pain of the second stage of labor. It must be remembered that an operator of Potter's skill, experience, manual dexterity, and indefatigable energy, who has perfected himself in the details of one

procedure must necessarily look upon the wider indications for version with bias and his results cannot be justly comparable with those of others with fewer opportunities; hence his indications cannot be admitted even on his statistics.

As a whole the book is a valuable contribution on the subject of version and the chapter on technic deserves the consideration of every obstetrician.

JOHN OSBORN POLAK.

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## Original Communications

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### MORPHOMETRY OF THE HUMAN FETUS WITH SPECIAL REFERENCE TO THE OBSTETRIC MEASUREMENTS OF THE HEAD\*

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*From the Department of Obstetrics and Gynecology and the Department of  
Anatomy of the University of Minnesota.*

IT IS a well-recognized fact that present methods of determining the size and body proportions of the fetus *in utero* are distinctly inadequate. Estimation of age from the menstrual history is often as much as four weeks in error, while palpation of the abdomen is hardly more certain. The Mueller maneuver gives valuable information only in certain cases. Roentgenological estimation of the size of the fetal head has been entirely unsuccessful. In short, questions of disproportion between passage and passenger must remain, at present, unanswered while the problems of viability and maturity can be only partially solved. It is the aim of the present research to supply this much-needed information; and it is the purpose of this paper to present, in particular, that part of a study of fetal growth which deals with the obstetric measurements of the head.

In order to compare this series of measurements with other studies of the growth of the fetal head a brief review of the literature on this field is given here. Such related subjects as the measurements of

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The writer wishes to acknowledge his appreciation to Dr. J. C. Litzenberg for his helpful guidance, to Dr. F. L. Adair for his valuable aid in furnishing material and many important suggestions, to Dr. R. E. Scammon for his specific advice, and to all for their continued interest in this work.

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NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

the newborn, growth of other parts of the body, and of the body as a whole, will not be included in this discussion.

To Dr. J. Clarke<sup>9</sup> goes the credit of having made the first accurate study of either fetal or newborn heads. He attempted to determine why more stillbirths occurred in male than in female children. His procedure consisted in taking weights, horizontal head circumferences, and an ear to ear measurement over the vertex in 120 newborn children, 60 of each sex. He concluded that the larger head of the male accounted for the higher mortality in that sex.

Since that time many studies of the fetal head have been made, using as a basis for the analysis either body weight, or length of gestation, or both. Of these the more important are Spondli,<sup>49</sup> Pfannkuch,<sup>41</sup> Fehling,<sup>12</sup> Jousset,<sup>26</sup> Arnovljevic,<sup>1</sup> Brandt,<sup>5</sup> Bouillet,<sup>4</sup> Schaeffer,<sup>45</sup> La-Torre,<sup>32</sup> Dardel,<sup>10</sup> Faucon,<sup>11</sup> Weisz,<sup>62</sup> Corrado,<sup>9a</sup> Ballantyne,<sup>2</sup> Legou,<sup>34</sup> Retzius,<sup>42</sup> Friedenthal,<sup>14</sup> Michaelis,<sup>39</sup> Jackson,<sup>24</sup> Lutz,<sup>36</sup> Heuser,<sup>20</sup> Kjölseth,<sup>28</sup> Beneke,<sup>3</sup> and more recently and particularly Streeter.<sup>51</sup>

Pfannkuch<sup>41</sup> noted that the biparietal diameter was always 26.7 to 26.8 per cent of the sum of the biparietal, occipitofrontal and occipitomenthal diameters of the newborn head. In his own words he states: "Man auf diese Weise eine einfache Formel finden könnte, welche die eine grössere Annäherung an den Terminus *a quo* der Reife gestattet, als die einseitige Verwerthung eines Maasses es ermöglicht."

Probably the two most intensive attempts along this line so far are those of Kjölseth<sup>28</sup> and Corrado.<sup>9a</sup> Unfortunately Kjölseth did not publish her individual measurements and hence her work is not as valuable for the present study as that of Corrado who presented all of his individual readings. Kjölseth made observations upon 250 children born in the Kristiania Klinik. She chose the fourth day of postnatal life as the time to make her measurements. Her analysis was based upon sex of the child and age and parity of the mother; and she, like all other observers recording series of measurements in the literature, did not use body length as a basis for study. Corrado<sup>9a</sup> studied 250 dead fetuses. He used age and sex as a basis.

Jackson<sup>24</sup> has also made a study of head volume increase in fetal life.

Others who published individual head measurements include Spondli,<sup>49</sup> Spiegelberg,<sup>48</sup> Fehling,<sup>12</sup> Jousset,<sup>26</sup> Budin and Ribemont,<sup>7</sup> Faucon,<sup>11</sup> Weisz,<sup>62</sup> Legou,<sup>34</sup> Retzius,<sup>42</sup> Friedenthal,<sup>14</sup> Michaelis,<sup>39</sup> Heuser,<sup>20</sup> and Lutz.<sup>36</sup> These observations will be briefly described here.

Spondli,<sup>49</sup> studied 100 living newborn infants in Zurich.

Spiegelberg<sup>48</sup> measured 53 premature infants in Breslau in connection with a study of newborn measurements.

Jousset<sup>26</sup> published examples of the values of the different diameters for each month of pregnancy. It is not evident that more than one specimen for each month was so studied.

Budin and Ribemont<sup>7</sup> made observations on 39 dead, apparently fresh fetuses, in Paris.

Weisz<sup>62</sup> does not state the number of cases studied. His observations, as well as those of Lutz and Fehling, were based on living newborn fetuses of the last trimester of pregnancy. Lutz<sup>35</sup> measured height, weight, and horizontal head circumference on over 1000 cases in Berlin. Fehling<sup>12</sup> studied horizontal head circumference in 300 newborn infants in Leipzig.

Legou,<sup>34</sup> in Paris, made observations on 106 fetuses of the third to the sixth month.

Retzius<sup>42</sup> studied 48 and Friedenthal<sup>14</sup> 10 preserved specimens. Formalin was employed as preservative in most of Retzius' and in all of Friedenthal's specimens.

Michaelis<sup>30</sup> measured 100 dead, apparently fresh, fetuses.

Heuser<sup>20</sup> in Marburg made a graphic analysis, based on age, of 61 fetuses measured. His graphs are very striking but a close examination of his data indicates such definite results are not justified. By his own statement, he had too few cases from which to draw any definite conclusions.

Calderini<sup>8</sup> made a very extensive study of the bi-parietal and bi-temporal diameters of the fetal head in the last three months of pregnancy. They are, however, published in such a form as to make them impossible of analysis.

Schaeffer<sup>45</sup> published only ranges for the values of the different dimensions in the different months of pregnancy. Neither individual measurements nor definite averages appear in this paper. This makes its value doubtful for the present analysis.

Several attempts to correlate the size and body proportions of the offspring with one, or the other, parent have also appeared in the literature; von Skalowski,<sup>61</sup> Gönner,<sup>15</sup> Heckmann,<sup>18</sup> Weisz,<sup>62</sup> and Riggs.<sup>43</sup> These are very interesting but not convincing. Moreover they deal with the newborn and older infants and do not properly come within the scope of this paper.

Hecker and Jellinghaus<sup>25</sup> found that the fetal head varied considerably in shape, and might, therefore, be very influential in determining the type of presentation. Sergi,<sup>47</sup> Tovo,<sup>56</sup> and Frassetto<sup>13</sup> described changes in the shape of the dried fetal skull at different periods of pregnancy, likening these different shapes to mathematical figures, as ellipsoidal, pentagonal, etc.

Ballantyne<sup>2</sup> was able to collect measurements of three apparently unmoulded heads and deduced therefrom average measurements for



full term fetal heads *in utero*. He also made a study of the effects of birth molding on the different diameters of the head. Other students of the effects of labor on the shape of the fetal head include Swayne,<sup>53</sup> Runge,<sup>44</sup> Stumpf,<sup>52</sup> Mueller,<sup>40</sup> and Kaznelson.<sup>27</sup> Of these, Stumpf has brought out the most comprehensive piece of work, a study of birth molding in 66 cases. He took several measurements of the head at birth and repeated them several days later when the effects of molding had passed off, and yet before any considerable growth had occurred. This work is important, in determining the final condition *in utero*, but needs to be verified by a study of un moulded heads.

#### MATERIAL AND METHODS

The material used consisted of some four hundred and fifty preserved human fetuses, from the collections of the Department of Anatomy and the Department of Obstetrics and Gynecology of the School of Medicine of the University of Minnesota. These were first carefully surveyed with the view to making use of only those heads which were not obviously abnormal, either in contour, or in size. It was found that some few specimens had been flattened posteriorly or laterally during preservation, either from too crowded quarters or from some other, less apparent, cause. Moreover, three were obviously hydrocephalic and one microcephalic. Another was acromegalic and another a negro. A few were found to be very soft and, hence, not desirable subjects for anthropometric study. All such undesirable specimens were eliminated, leaving only class A and a few of the class B of Streeter.<sup>61</sup> The selected group numbered three hundred and sixty-nine (369) specimens, ranging from 23 mm. to 544 mm. standing height. It was found that attempts to measure the different diameters and circumferences of specimens below 23 mm. standing height were attended with such a degree of uncertainty as to make the findings of little value. No specimens above 550 mm. standing height were used because of a grave doubt lest they might be distinctly postmature and that they would not represent the usual newborn characteristics. The series included six pairs of twins, and one set of triplets.

These specimens, arranged in groups of 5 cm. intervals, were distributed according to Table I.

All of the fetuses had been preserved in one of two ways. Those specimens which would be satisfactorily hardened in 10 per cent formalin were thus dealt with. A part of those over 30 to 35 centimeters standing height were first injected through the umbilical vein with a 10 per cent solution of formalin containing 1 per cent of chromic acid. The amount injected varied according to necessity in the judgment of the embalmer, Mr. M. Larson. Usually about 30 per cent of the body weight was used. These specimens were then kept in 10 per

TABLE I

DISTRIBUTION OF MATERIAL ACCORDING TO TOTAL LENGTH						
Up to 49 mm. standing height—17 specimens.						
50	—	99	“	“	—29	“
100	—	149	“	“	—45	“
150	—	199	“	“	—28	“
200	—	249	“	“	—52	“
250	—	299	“	“	—46	“
300	—	349	“	“	—36	“
350	—	399	“	“	—36	“
400	—	449	“	“	—29	“
450	—	499	“	“	—24	“
500	—	549	“	“	—27	“

cent formalin. In order that variability in the effects of preservation might not alter the figures, no specimens were used which had been in the preservative less than six months. Many of them were two or more years in formalin solution.

The instruments used in making the measurements consisted of a steel meter tape, a brass bound wooden meter stick, and a sliding caliper, made of steel and accurately constructed. All of these were calibrated in millimeters and checked with one another very closely. The caliper carried a vernier scale, making possible readings to tenths of a millimeter where desirable. The arms of the caliper had sharp points on one side, flat bars on the other.

The linear measurements were usually taken with the calipers,—the exceptions will be spoken of later. The circumferences were taken with the steel tape except where the readings were 100 mm. or less. In these instances a heavy inelastic linen thread was wound around the part at the proper place, and the overlapping ends cut across with a sharp cataract scissors. The resulting circle of thread was then measured with the caliper or tape. All readings were recorded in millimeters.

The measurements, taken on each specimen, were ten of the so-called obstetrical measurements of the head, along with the sitting and standing height. In a few of the specimens the lower jaw had previously been removed, thus prohibiting some of the measurements. In a few others some of the distances were not taken because of the presence of an unusually large caput succedaneum or for some other, equally good, reason.

The measurements taken, and the technics employed for each were as follows:

1. Sitting height, or crown-rump (C. R.), was taken with the body in an extended attitude (as one would sit erect) with the chin and thighs as nearly as possible at right angles with the body. The readings were taken with the sliding caliper except where the specimens were too long. For these a sliding caliper, in effect, was made from the meter stick, laid parallel to the body and perpendic-

TABLE II  
Occipito-Frontal Diameter of Head (Glabella-Inion)  
235 CH (mm) + 40 mm. (369 cases)

Crown-Heel Length (mm)		Crown Pump Length (mm)	Occipito-Frontal Diameter (mm)				Difference between (a) and (b)		Number of cases	Calculated Values of 5cm Intervals of Crown-Heel Length		
Range	Mean		Observed			Calculated Mean (b)	mm	Percent		CH Length (cm)	Value (mm)	Percent increment
			Max.	Min.	Mean (a)							
25-50	37.2	31.4	18	10	13.7	12.7	-1.0	-7.3	17	5	15.75	—
50-100	75.4	57.0	27	14	21.7	21.7	0.0	0.0	29	10	27.50	75
100-150	124.2	88.9	39	26	33.2	33.2	0.0	0.0	45	15	39.25	45
150-200	172.8	119.4	51	38	44.7	44.6	-0.1	-0.2	28	20	51.00	30
200-250	225.3	152.3	68	48	57.9	56.9	-1.0	-1.7	52	25	62.75	25
250-300	272.1	183.9	78	60	69.2	68.6	-0.6	-0.9	46	30	74.50	19
300-350	323.9	223.7	90	71	80.0	80.1	+0.1	+0.1	36	35	86.25	16
350-400	370.6	248.2	101	79	88.8	91.1	+2.3	+2.6	36	40	98.00	13
400-450	423.6	287.9	115	87	99.9	103.5	+3.6	+3.6	29	45	109.75	12
450-500	471.4	318.5	123	99	109.2	114.8	+5.6	+5.1	24	50	122.50	10
500-544	523.4	358.1	129	105	117.2	127.0	+9.8	+8.4	27	55	134.25	9

TABLE III  
Bi-Parietal Diameter of Head (Maximum)  
19 CH (mm) + 20 mm. (369 cases)

Crown-Heel Length (mm)		Crown-Rump Length (mm)	Bi-Parietal Diameter (mm)				Difference between (a) and (b)		Number of cases	Calculated Values of 5cm Intervals of Crown-Heel Length		
Range	Mean		Observed			Calculated Mean (b)	mm	Percent		CH Length (cm)	Value (mm)	Per cent increment
			Max	Min	Mean (a)							
25-50	37.2	31.4	12	6	9.5	9.1	-0.4	-4.2	17	5	11.5	—
50-100	75.4	57.0	20	10	16.2	16.3	+0.1	+0.6	29	10	21.0	63
100-150	124.2	88.9	32	21	26.3	25.6	-0.7	-2.7	45	15	30.5	45
150-200	172.8	119.4	41	29	35.5	34.8	-0.7	-2.0	28	20	40.0	31
200-250	225.3	152.3	54	35	45.5	44.6	-0.9	-1.1	52	25	49.5	24
250-300	273.1	183.9	66	43	55.9	53.9	0.0	0.0	46	30	59.0	19
300-350	323.9	223.7	77	52	62.5	63.5	+1.0	+1.6	36	35	68.5	16
350-400	370.6	248.2	78	58	69.6	72.4	+2.8	+4.0	36	40	78.0	14
400-450	423.2	287.9	84	66	77.5	82.4	+4.9	+6.6	29	45	87.5	12
450-500	471.4	318.5	99	70	87.0	91.6	+4.6	+5.3	24	50	97.0	11
500-544	523.4	358.1	102	85	94.0	101.4	+7.4	+7.9	27	55	106.5	10

ular bars applied to it at the proper places. No compression was exercised in taking the readings.

2. Standing height, or crown-heel (C. H.), was found by adding trochanter-to-heel, less trochanter-to-rump to the sitting height, in each case care being exercised to find the center of the trochanter. In those specimens in which it was found impossible to extend the legs on the thighs the trochanter-to-heel measurement was taken in two segments. Trochanter to the center of the lateral surface of the knee joint was first taken, and to this was added the distance from the latter point to the heel. These two measurements were taken uniformly along the right side of the body and were all checked at least once to insure the highest possible degree of accuracy.

3. Head length, or the occipito-frontal diameter (O. F.), was taken from glabella to inion, the longest diameter without respect to the horizontal.

4. Suboccipito-frontal diameter (S. O. F.) was taken from the obstetrical joint (the union of superior and lateral portions of the occipital bone) to the most distant point on the frontal bones.

TABLE IV  
SUBOCCIPITO-BREGMATIC DIAMETER OF HEAD  
2 CH (MM)+60MM (368 CASES)

Crown Heel Length (mm)		Crown Rump Length (mm)	Suboccipito-Bregmatic Diameter (mm)				Difference between (a) and (b)		Number of cases	Calculated Values at 5cm Intervals of Crown Heel Length		
			Observed			Calculated				CH Length (cm)	Value (mm)	Percent increment
Range	Mean		Max	Min	Mean (a)	Mean (b)	mm	Percent				
25-50	37.2	31.4	17	9	13.2	13.4	+0.2	+1.5	17	5	160	—
50-100	75.4	57.0	25	12	21.0	21.1	+0.1	+0.5	29	10	260	63
100-150	124.2	88.9	40	24	31.4	30.8	-0.6	-1.9	45	15	360	38
150-200	172.8	119.4	48	37	41.6	40.6	-1.0	-2.4	28	20	460	28
200-250	223.3	152.3	63	43	52.3	51.1	-1.4	-2.7	52	25	560	22
250-300	273.5	184.1	70	51	61.6	60.7	-1.1	-1.8	45	30	660	16
300-350	323.9	223.7	82	62	71.0	70.6	-0.2	-0.3	36	35	760	13
350-400	370.6	248.2	88	67	79.9	80.1	+0.2	+0.3	36	40	860	13
400-450	423.2	287.9	96	78	87.9	90.6	+2.7	+3.1	29	45	960	12
450-500	471.4	318.5	109	83	95.2	100.3	+5.1	+5.4	24	50	1060	10
500-544	523.4	358.1	110	94	102.3	110	+8.4	+8.2	27	55	1160	9

TABLE V  
SUBOCCIPITO-FRONTAL DIAMETER OF HEAD  
2.15 CH (MM)+70MM (368 CASES)

Crown Heel Length (mm)		Crown Rump Length (mm)	Suboccipito-Frontal Diameter (mm)				Difference between (a) and (b)		Number of cases	Calculated Values at 5cm Intervals of Crown Heel Length		
			Observed			Calculated				CH Length (cm)	Value (mm)	Percent increment
Range	Mean		Max	Min	Mean (a)	Mean (b)	mm	Percent				
25-50	37.2	31.4	18	10	14.5	14.9	+0.4	+2.8	17	5	17.75	—
50-100	75.4	57.0	28	15	22.4	23.2	+0.8	+3.6	29	10	28.5	61
100-150	124.2	88.9	41	25	33.6	33.7	+0.1	+0.3	45	15	39.25	38
150-200	172.8	119.4	50	38	44.8	44.2	-0.6	-1.3	28	20	50.00	27
200-250	223.3	152.3	65	47	56.9	55.4	-1.5	-2.6	52	25	60.75	22
250-300	273.5	184.1	77	58	67.1	65.8	-1.3	-1.9	45	30	71.50	16
300-350	323.9	223.7	87	68	76.3	76.6	+0.3	+0.4	36	35	82.25	15
350-400	370.6	248.2	97	73	85.1	86.7	+1.6	+1.9	36	40	93.00	13
400-450	423.2	287.9	108	82	93.6	98.0	+4.4	+4.7	29	45	103.75	12
450-500	471.4	318.5	115	89	102.4	108.4	+6.0	+5.9	24	50	114.50	10
500-544	523.4	358.1	118	99	111.0	119.5	+8.5	+7.7	27	55	125.25	9

5. Suboccipito-bregmatic diameter (S. O. B.) was found by taking a similar measurement whose second point was the median point of the coronal suture.

6. Occipito-mental diameter (O. M.) was measured from menton toinion.

7. Head width, or bi-parietal diameter (Bi-P), was always the greatest width of the head above the external auditory meati. This was found, almost always, over the parietal eminences.

8. Horizontal head circumference (H. H. C.) was taken around glabella andinion.

9. Suboccipito-frontal circumference (S. O. F. C.) was taken around the points over which the corresponding diameter was measured.

10. Suboccipito-bregmatic circumference (S. O. B. C.) was also found in a similar manner to the corresponding diameter.

11. Occipital-mental circumference (O. M. C.) was taken around menton andinion.

12. A circumference, designated as "large circumference" (L. C.) was taken around menton and superior tip of occipital bone. This is not the largest cir-

cumference of the head, as Ballantyne<sup>2</sup> and others have shown. It was chosen in preference to the largest circumference because of more definite landmarks, and because of more frequent mention in obstetrics.

A very slight uniform pressure was used in all of the measurements with the idea of entirely avoiding compression, and yet not allowing

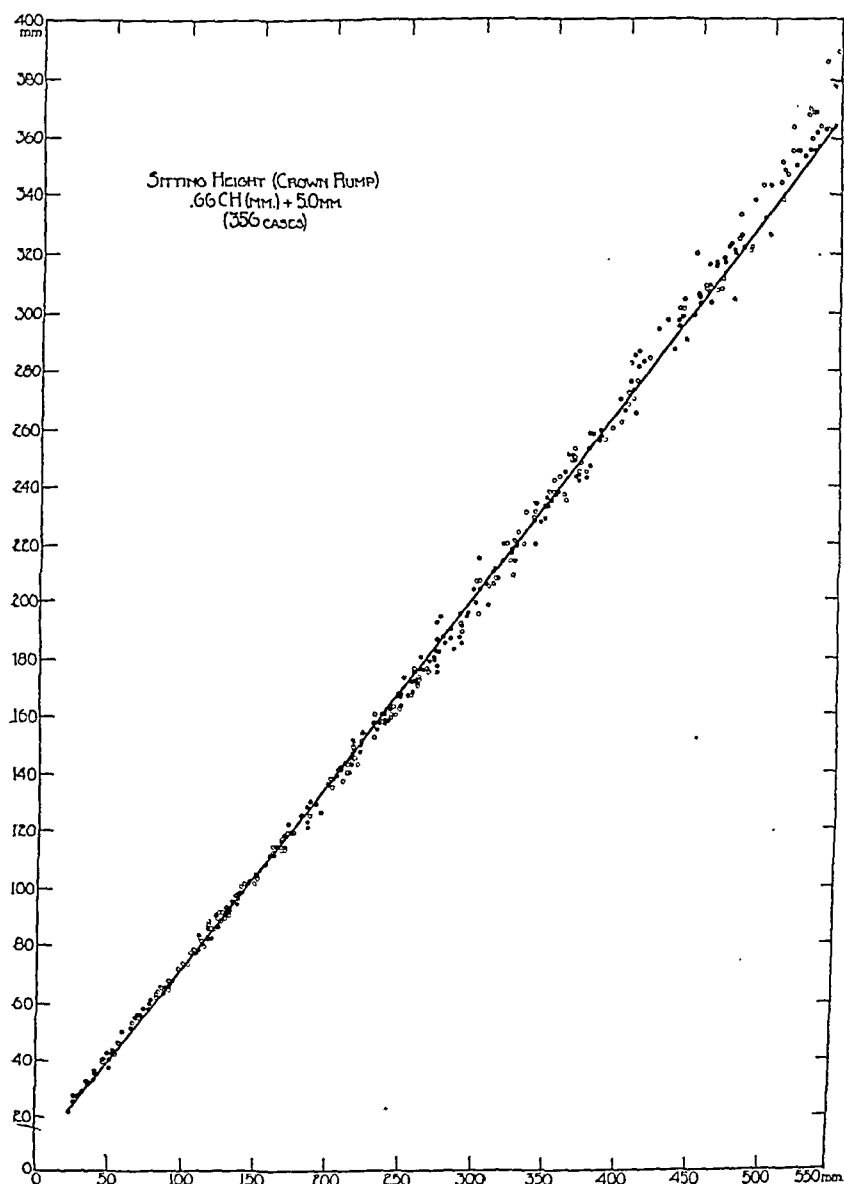


Fig. 1.

any slack to be present in the measuring tape. The specimens were also removed from the solutions, long enough previous to measuring, to allow the external moisture to evaporate, and yet not long enough to allow any "drying out." The length of time varied, according to size, from a few minutes for the smaller ones to nearly an hour for

the larger ones. All measurements were recorded in millimeters, and will so appear in all succeeding tables and figures.

As soon as the series of readings was completed they were assembled and arranged in a table which on account of its length is not published but may be found on file in the Wistar Institute of Anatomy,

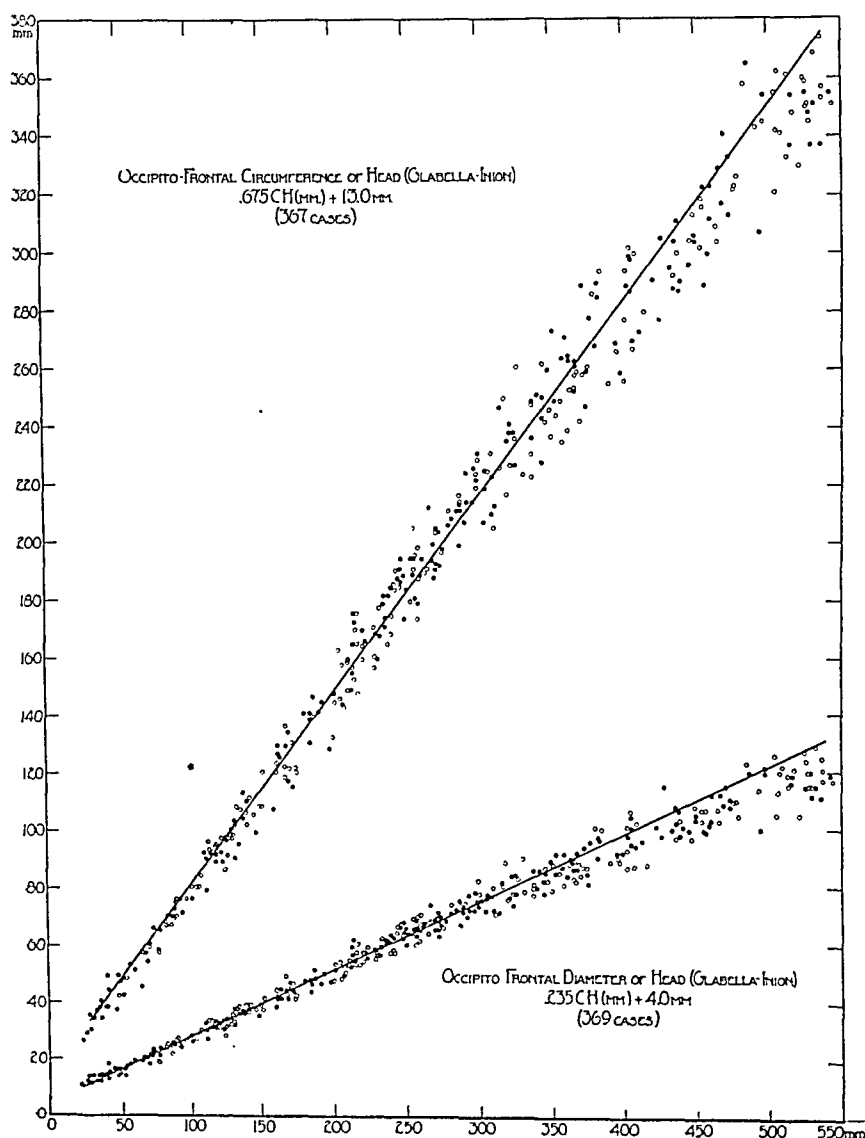


Fig. 2.

of Philadelphia. The amount of variation in the individual measurements was, on the whole, very slight.

The crown rump (C.R.) was then plotted, as ordinate, on coordinate paper, against the crown heel (C.H.), as abscissa. The resulting field graph is shown in Fig. 1. The males are represented by dots, the females by circles. Where the specimens were so small as

TABLE VI  
OCCIPITO-MENTAL DIAMETER OF HEAD (MENTON-INION)  
.235 CH (mm) + 2.0 MM. (365 CASES)

Crown-Heel Length (mm)		Crown Rump Length (mm)	Occipito-Mental Diameter (mm)				Difference between (a) and (b)		Number of cases	Calculated Values at 5cm. Intervals of Crown-Heel Length		
			Observed			Calculated Mean (b)				CH Length (cm)	Value (mm)	Percent increment
Range	Mean		Max	Min	Mean (a)		mm	Per cent				
25-50	36.6	30.9	16	8	12.1	10.6	-1.5	-12.4	16	5	13.75	—
50-100	75.4	57.0	25	14	20.1	19.7	-0.4	-2.0	29	10	25.50	85
100-150	124.2	88.9	36	24	30.5	31.2	+0.7	+2.3	45	15	37.25	46
150-200	172.8	119.4	46	37	42.1	42.6	+0.5	+1.2	28	20	49.00	32
200-250	225.3	152.5	66	47	56.1	54.9	-1.2	-2.1	50	25	60.75	24
250-300	273.5	184.1	76	58	67.8	66.5	-1.5	-2.2	45	30	72.50	19
300-350	323.9	225.7	88	70	79.5	78.1	-1.4	-1.8	36	35	84.25	16
350-400	370.6	246.2	104	82	89.6	89.1	-0.5	-0.6	36	40	96.00	14
400-450	423.2	287.9	107	89	100.2	101.5	+1.3	+1.5	29	45	107.75	12
450-500	471.4	318.5	129	103	112.7	112.8	+0.1	+0.1	24	50	119.5	11
500-544	523.4	358.1	142	112	125.4	125.0	+0.4	+1.5	27	55	131.25	10

TABLE VII  
OCCIPITO-FRONTAL CIRCUMFERENCE OF HEAD (GLABELLA-INION)  
.675 CH (mm) + 13.0 MM. (367 CASES)

Crown-Heel Length (mm)		Crown Rump Length (mm)	Horizontal Head Circumference (mm)				Difference between (a) and (b)		Number of cases	Calculated Values at 5cm. Intervals of Crown-Heel Length		
			Observed			Calculated Mean (b)				CH Length (cm)	Value (mm)	Percent increment
Range	Mean		Max	Min	Mean (a)		mm	Per cent				
25-50	36.6	31.0	49	26	37.5	37.7	+0.2	+0.5	16	5	45.75	—
50-100	75.4	57.0	76	42	61.9	63.9	+2.0	+3.2	29	10	60.50	72
100-150	124.2	88.9	113	76	95.6	96.8	+1.2	+1.3	45	15	114.25	42
150-200	172.8	119.4	146	107	131.8	129.6	-2.2	-1.7	28	20	148.00	30
200-250	225.3	152.5	194	142	167.1	165.1	-2.0	-1.2	52	25	181.75	24
250-300	273.5	183.9	225	173	199.8	197.3	-2.5	-1.3	46	30	215.50	19
300-350	323.9	225.7	261	204	232.6	231.6	-1.0	-0.4	36	35	249.25	16
350-400	369.9	246.2	293	234	260.2	262.7	+2.5	+1.0	35	40	283.00	14
400-450	423.2	287.9	312	255	290.6	293.7	+3.1	+2.8	29	45	316.75	12
450-500	471.4	318.5	364	288	322.9	331.2	+8.3	+2.6	24	50	350.50	11
500-544	523.4	358.1	373	320	348.5	366.3	+17.8	+5.1	27	55	384.25	10

TABLE VIII  
SUBOCCIPITO-BREGMATIC CIRCUMFERENCE OF HEAD  
.625 CH (mm) + 16.0 MM. (365 CASES)

Crown-Heel Length (mm)		Crown Rump Length (mm)	Suboccipito-Bregmatic Circumference (mm)				Difference between (a) and (b)		Number of cases	Calculated Values at 5cm. Intervals of Crown-Heel Length		
			Observed			Calculated Mean (b)				CH Length (cm)	Value (mm)	Percent increment
Range	Mean		Max	Min	Mean (a)		mm	Per cent				
25-50	36.6	31.0	48	28	37.4	36.9	+0.5	+4.0	16	5	47.25	—
50-100	75.4	57.0	76	41	61.7	63.1	+1.4	+2.3	29	10	78.50	66
100-150	124.1	88.8	110	75	94.6	95.6	-1.0	-1.1	44	15	109.75	40
150-200	172.8	119.4	140	106	124.0	124.0	0.0	0.0	28	20	141.00	28
200-250	225.3	152.5	184	130	160.2	156.8	-3.4	-2.1	52	25	172.25	22
250-300	273.5	184.1	210	161	191.3	186.9	-4.4	-2.3	45	30	203.50	18
300-350	323.9	225.7	247	195	222.2	218.4	-3.8	-1.7	36	35	234.75	15
350-400	369.9	246.2	281	221	248.5	247.2	-1.3	-0.4	35	40	266.00	13
400-450	423.2	287.9	291	246	273.2	280.5	+7.3	+2.7	29	45	297.25	12
450-500	471.4	318.5	332	282	303.8	310.6	+6.8	+2.2	24	50	328.50	11
500-544	523.4	358.1	347	308	326.5	343.1	+16.6	+5.1	27	55	359.75	10

TABLE IX  
SUBOCCIPITO-FRONTAL CIRCUMFERENCE OF HEAD  
.65 CH (MM) + 150 MM (366 CASES)

Crown Heel Length (mm)		Crown Rump Length (mm)	Suboccipito Frontal Circumference (mm)				Difference between (a) and (b)		Number of cases	Calculated Values at 5 cm Intervals of Crown Heel Length		
			Observed			Calculated				CH Length (cm)	Value (mm)	Per cent increment
Range	Mean		Max	Min	Mean(a)	Mean(b)	mm	Per cent				
25-50	36.6	31.0	50	28	39.0	38.6	-0.2	-0.5	16	5	47.5	—
50-100	73.4	57.0	78	45	62.9	64.0	+1.1	+1.7	29	10	80.0	68
100-150	124.2	88.9	115	75	96.8	95.7	-1.1	-1.1	45	15	112.5	41
150-200	172.8	119.4	145	111	132.7	127.5	-5.4	-4.1	28	20	145.0	29
200-250	225.5	152.5	192	141	166.5	161.4	-5.1	-3.1	52	25	177.5	22
250-300	273.5	184.1	224	170	197.7	192.8	-4.9	-2.5	45	30	210.0	18
300-350	323.9	223.7	257	201	227.8	225.5	-2.5	-1.0	36	35	242.5	15
350-400	369.9	248.2	284	225	254.5	255.4	+0.9	+0.4	35	40	275.0	13
400-450	423.2	287.9	300	248	280.5	290.1	+9.8	+3.5	29	45	307.5	12
450-500	471.4	318.5	354	280	312.5	321.4	+9.1	+2.9	24	50	340.0	11
500-544	523.4	358.1	367	319	358.9	355.2	-4.6	+4.8	27	55	372.5	10

TABLE X  
OCCIPITO-MENTAL CIRCUMFERENCE OF HEAD (MENTON-INION)  
.63 CH (MM) + 90 MM (355 CASES)

Crown Heel Length (mm)		Crown Rump Length (mm)	Occipito-Mental Circumference (mm)				Difference between (a) and (b)		Number of cases	Calculated Values at 5cm Intervals of Crown Heel Length		
Range	Mean		Observed			Calculated Mean(b)	mm	Percent		CH Length (cm)	Value (mm)	Per cent increment
		Max	Min	Mean(a)								
25-50	35.9	30.5	47	23	33.4	31.6	-1.8	-5.4	15	5	40.5	—
50-100	73.4	57.0	73	40	53.6	56.5	+2.9	+5.4	29	10	72.0	78
100-150	123.5	88.4	101	63	83.5	86.8	+3.3	+4.0	43	15	103.5	44
150-200	172.8	119.4	135	95	117.5	117.9	+0.4	+0.3	28	20	135.0	30
200-250	225.5	152.5	181	125	156.0	150.9	-5.1	-3.3	50	25	166.5	23
250-300	273.1	185.9	217	162	186.6	181.1	-5.5	-2.9	46	30	198.0	19
300-350	323.9	223.7	257	190	219.8	215.1	-4.7	-3.0	36	35	229.5	16
350-400	369.9	248.2	279	215	245.9	242.0	-3.9	-1.6	35	40	261.0	14
400-450	423.5	288.1	297	230	270.9	275.8	+4.9	+1.8	28	45	292.5	12
450-500	471.5	318.5	367	269	308.4	306.0	-2.4	-0.8	23	50	324.0	11
500-544	523.5	358.4	380	307	356.2	359.9	+3.7	+1.1	22	55	355.5	9

TABLE XI  
LARGE CIRCUMFERENCE OF HEAD (MENTON-LAMBDA)  
72 CH (MM) + 100 MM (343 CASES)

Crown Heel Length (mm)		Crown Rump Length (mm)	Large Circumference (mm)				Difference between (a) and (b)		Number of cases	Calculated Values at 5cm Intervals of Crown Heel Length		
Range	Mean		Observed		Calculated		mm	Percent		CH Length (cm)	Value (mm)	Per cent increment
		Max	Min	Mean (a)	Mean (b)							
25-50	35.9	30.5	46	27	30.7	35.8	+0.9	+2.5	15	5	46.0	—
50-100	73.4	57.0	78	44	62.0	64.5	+2.5	+3.7	29	10	82.0	78
100-150	123.5	88.4	112	79	90.8	98.9	+8.1	+2.2	42	15	118.0	44
150-200	173.2	119.6	155	116	134.6	134.7	+0.1	+0.1	27	20	154.0	31
200-250	225.5	152.5	199	149	174.7	172.2	-2.5	-1.4	50	25	190.0	23
250-300	271.7	182.1	235	182	207.4	205.6	-1.8	-0.9	43	30	226.0	19
300-350	323.9	223.7	282	214	246.1	243.2	-2.9	-1.2	36	35	262.0	16
350-400	369.5	248.6	300	255	276.2	276.0	-0.2	-0.1	33	40	298.0	14
400-450	421.0	286.5	335	278	310.9	315.7	+4.8	+0.9	23	45	334.0	12
450-500	474.0	321.0	402	330	355.5	351.5	-4.0	-1.1	20	50	370.0	11
500-544	523.5	359.2	437	358	385.9	383.9	+2.0	+0.8	25	55	406.0	10



to make the sex indeterminate the symbol  $\otimes$  was used. The grouping of the several points was so close that similar graphs of the other measurements were made, Figs. 2 to 6. In each one, the diameter, or circumference, under consideration was plotted as ordinate, against the crown heel (C. H.) as abscissa, and the same plan of distinguishing sex was employed.

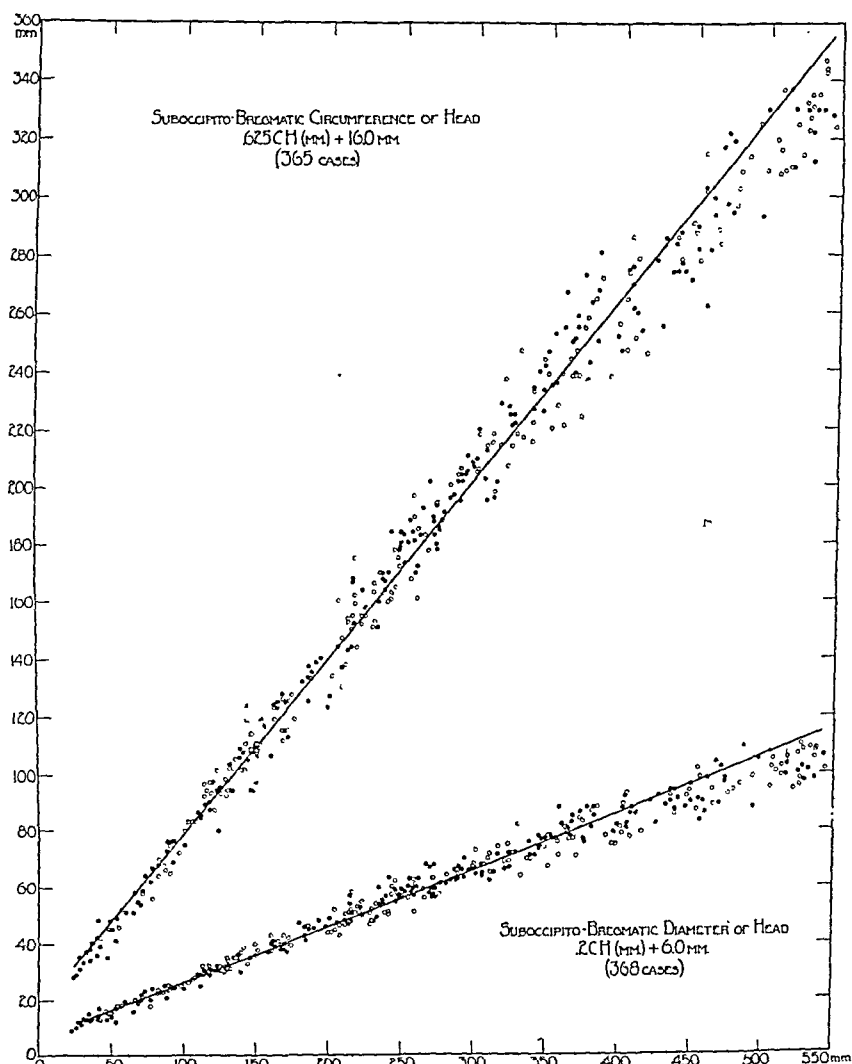


Fig. 3.

It was not at once evident which method of drawing the curves through these graphs would be the most satisfactory. Each of the three most common methods, not including inspection, namely, the weighted median, the weighted average, and the arithmetic average weighted by the median crown-heel height, was tried, and equally

satisfactory curves resulted. The method of the averages\* was chosen as being the one more commonly used, and, perhaps, the more readily comprehensible.

Fig. 7 with its solid line represents the field graph and resultant

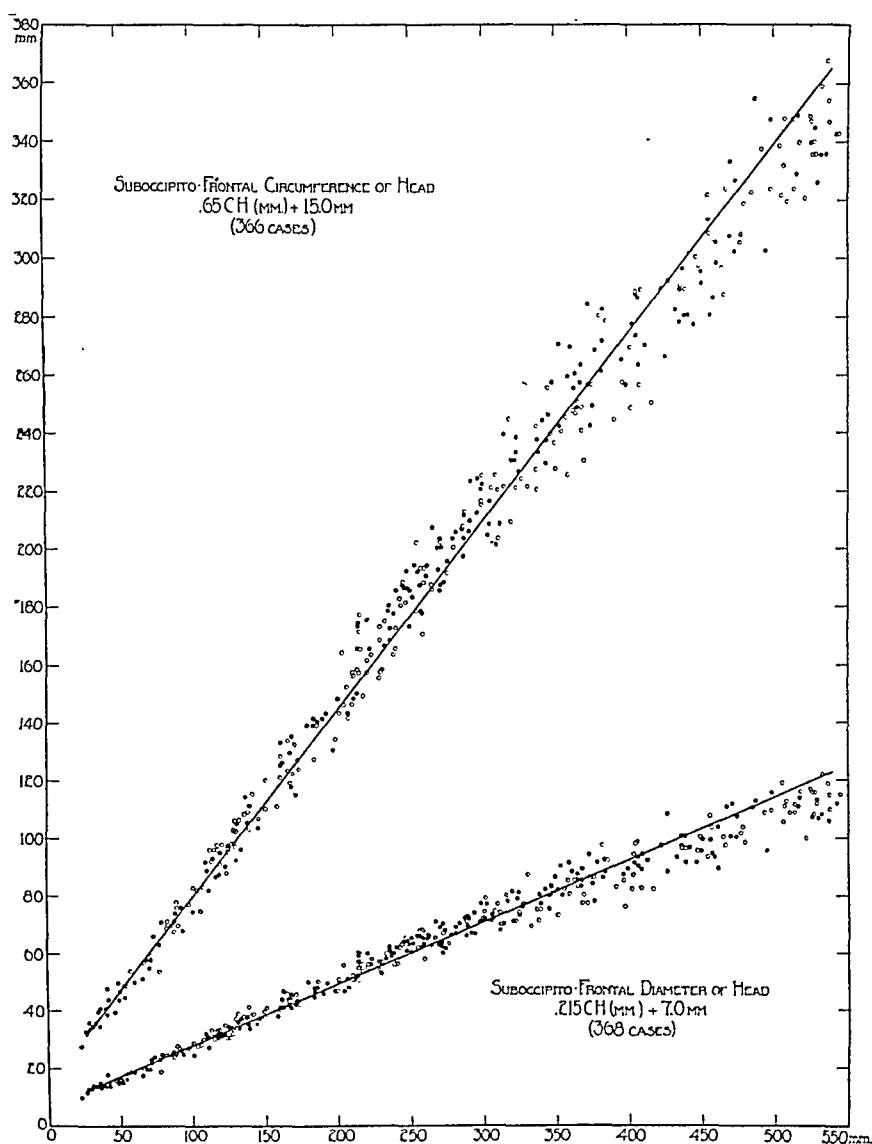


Fig. 4.

curve for the formalin preserved material, and, as such may be taken as quite representative of any series of Caucasian fetuses, similarly preserved. Similar curves resulted for the other measurements studied.

\*The arithmetic average, for example, of the occipitofrontal diameters of the cases in each five centimeter interval was plotted against the arithmetic average of the crown heel lengths for the same cases. The curve was drawn through these resulting points.

The data for the plotting of these curves along with the range for the separate intervals, appears in columns 1 to 6 of Tables II to XI.

### SUMMARY !

These curves were quite striking in their characteristics. The curve for Fig. 5 and the upper graph in Fig. 6 were practically straight lines

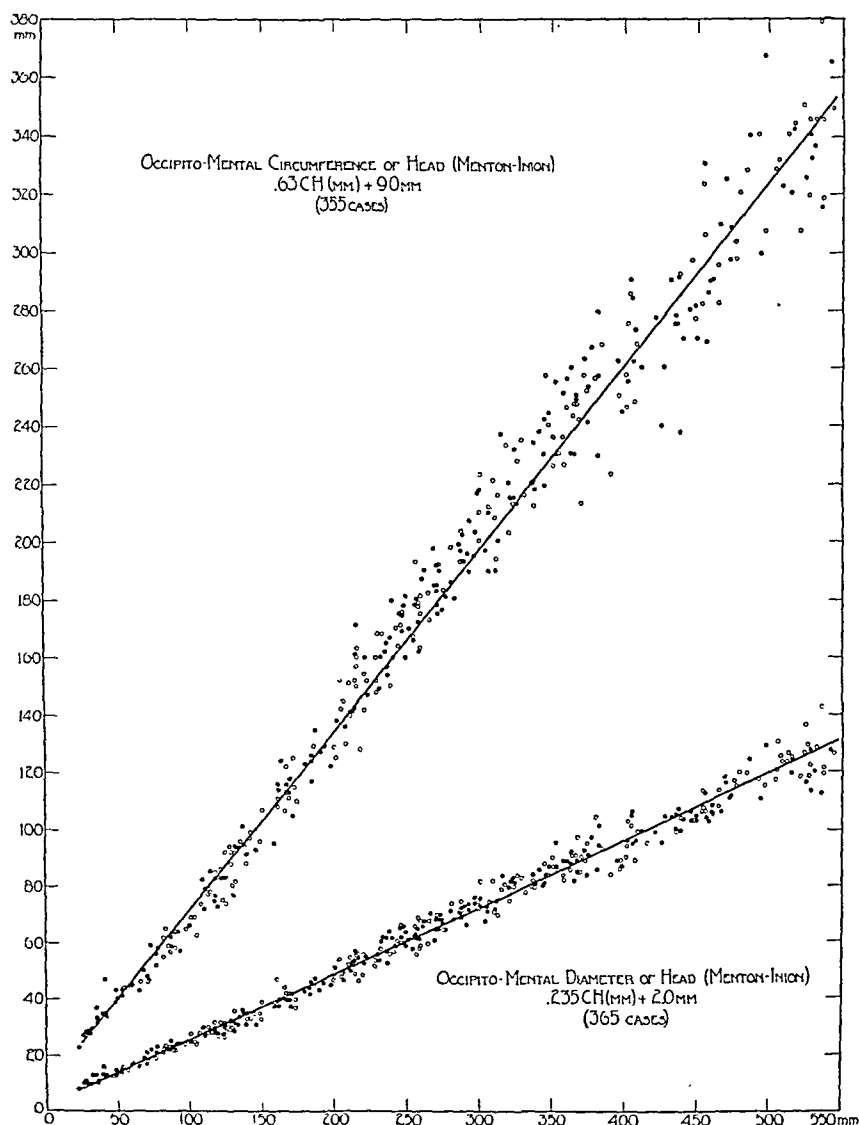


Fig. 5.

throughout. In Fig. 1 there resulted a straight line up to about 300 mm. standing height, at which point there was a deflection toward the vertical. The remaining curves were deflected downward at 300-350 mm. standing height from straight lines below that point. Feeling that these deflections might be artifacts, due to the type of

material, the writer undertook two other sets of investigations to determine:

1. The effects of preservation, as carried out on this material, and
2. The effects of birth moulding.

A chance observation of the injection process suggested the plan to be followed in the first of these two studies. Along with similar changes in the trunk, the cranial vault can be seen to increase in size, as one of these fetuses is injected through the umbilical vein. At the same time, and as a natural result of this swelling, the overriding of the cranial bones produced by birth moulding is, in part, eradicated. One might immediately arrive at the conclusion that such

TABLE XII  
MEASUREMENTS OF UNMOLDED HEADS (MM.)  
(LIVING INFANTS)

Period of Development	Name	Sex	Age in Hours	Parity of Mother	Method of Delivery	Crown-Rost Length	Head Diameters					Head Circumferences					Palpebrae Moulding
							OF	BIP	SOB	SOI	OM	HHC	SOBC	SOFC	OMC	LC	
Premature	Be	M	29	7	S	394	101	79	88	95	90	290	271	277	257	207	None
	Ti	M	29	7	Post	396	96	77	88	89	95	272	250	262	248	289	None
	Wi	M	28 1/2	1	C.S.	470	111	90	100	103	105	326	305	310	283	330	Very slight
	Br	F	1	VII	S	475	116	86	96	106	115	334	295	315	295	335	Slight transverse
	We	F	1	I	S	475	112	87	97	102	106	320	297	307	277	330	Slight transverse
Mature	Pa	F	2	I	S	480	118	89	95	103	115	338	305	312	310	345	None
	Es	M	6 1/2	IV	C.S.	485	126	103	109	118	117	360	329	349	335	367	None
	McA	M	1 1/2	?	S	490	124	93	104	113	120	355	320	331	310	360	Slight ant. post.
	Cl	F	2 1/2	I	S	490	122	91	99	110	111	338	307	319	291	355	Slight
	Cl	F	1 1/2	V	S	490	117	95	102	112	115	334	320	326	310	350	None
	Mo	M	3 1/2	I	S	490	124	93	105	114	121	351	324	331	280	360	Slight
	Br	M	7	II	C.S.	495	119	94	104	112	114	334	308	327	306	360	None
	Wo	M	3	I	S	498	122	101	100	112	118	353	330	335	310	358	Slight ant. post.
	Br	M	3	I	S	500	123	102	97	111	125	365	323	346	333	365	Little ant. post.
	Br	M	3	I	S	500	117	102	107	111	120	347	318	342	322	367	None
	De	M	7 1/2	V	S	500	124	93	106	116	119	345	330	334	325	360	None
	Oh	M	7 1/2	I	S	500	124	97	103	109	115	342	319	323	318	358	Slight ant. post.
	Os	M	19 1/2	I	S	500	123	101	108	110	125	353	322	328	312	362	Slight ant. post.
	Os	M	19 1/2	I	S	500	123	101	108	110	125	353	322	328	312	362	None
	Sw	M	10	I	S	505	114	97	104	112	114	343	326	328	312	354	Slight ant. post.
	O.C.	M	1	II	S	505	129	97	108	116	116	358	332	340	310	365	None
	Su	M	6 1/2	I	S	506	125	98	108	122	127	363	339	355	346	377	None
	Al	M	6 1/2	IV	S (I)	510	121	92	105	115	115	347	327	335	302	342	Slight transverse
	As	F	1 1/2	II	S	510	123	101	102	111	125	358	330	338	335	379	ant. post.
	Cl	F	13	I	S (I)	510	125	95	102	114	121	347	317	335	310	355	None
	Be	F	23	7	S (I)	513	128	100	114	120	120	366	342	351	320	375	None
	Te	F	3 1/2	VI	S	515	121	98	103	114	120	352	327	340	310	362	None
	Os	F	6 1/2	III	C.S.	510	120	101	104	113	124	357	347	354	305	380	None
	Il	M	4	I	S	520	117	102	108	115	115	354	340	348	327	383	Slight ant. post.
	En	M	2	I	S	522	115	91	100	110	116	350	318	325	312	350	None
	Wb	M	2 1/2	V	S	523	116	94	100	112	117	359	323	334	317	357	None
	Hi	M	3 1/2	I	S	528	122	104	110	115	123	375	345	348	332	384	Slight ant. post.
	Or	F	14	I	S	535	137	106	119	127	126	385	367	375	320	400	None
Average Newborn							505	122	97	105	114	352	326	337	316	366	
Postmature							570	124	109	117	125	365	341	355	322	385	Moderate ant. post.

injected fetuses would, at least in some respects, better represent the fetus *in utero* than the uninjected newborn material. This eventually proved to be the case. The detailed plan of study adopted was as follows: (1) measure fresh specimen; (2) measure again immediately after injection. (3) measure at monthly intervals for six months, omitting the fifth, to determine the changes following immersion in formalin. For the smaller fetuses which were not primarily injected, items 1 and 3 were carried out in a similar manner. The results obtained in this latter study on the uninjected specimens were quite significant. For the various measurements the averages obtained are shown in Table XIII.

Preservation by the immersion in formalin alone effects but little change in the dimensions under consideration. The changes noted

are each well within the limit of error in measuring those diameters and can therefore be neglected as far as correcting the curves in Figs. 1 to 6 is concerned. This is particularly true since the size of specimen seemed to bear no relation to the percentage change which oc-

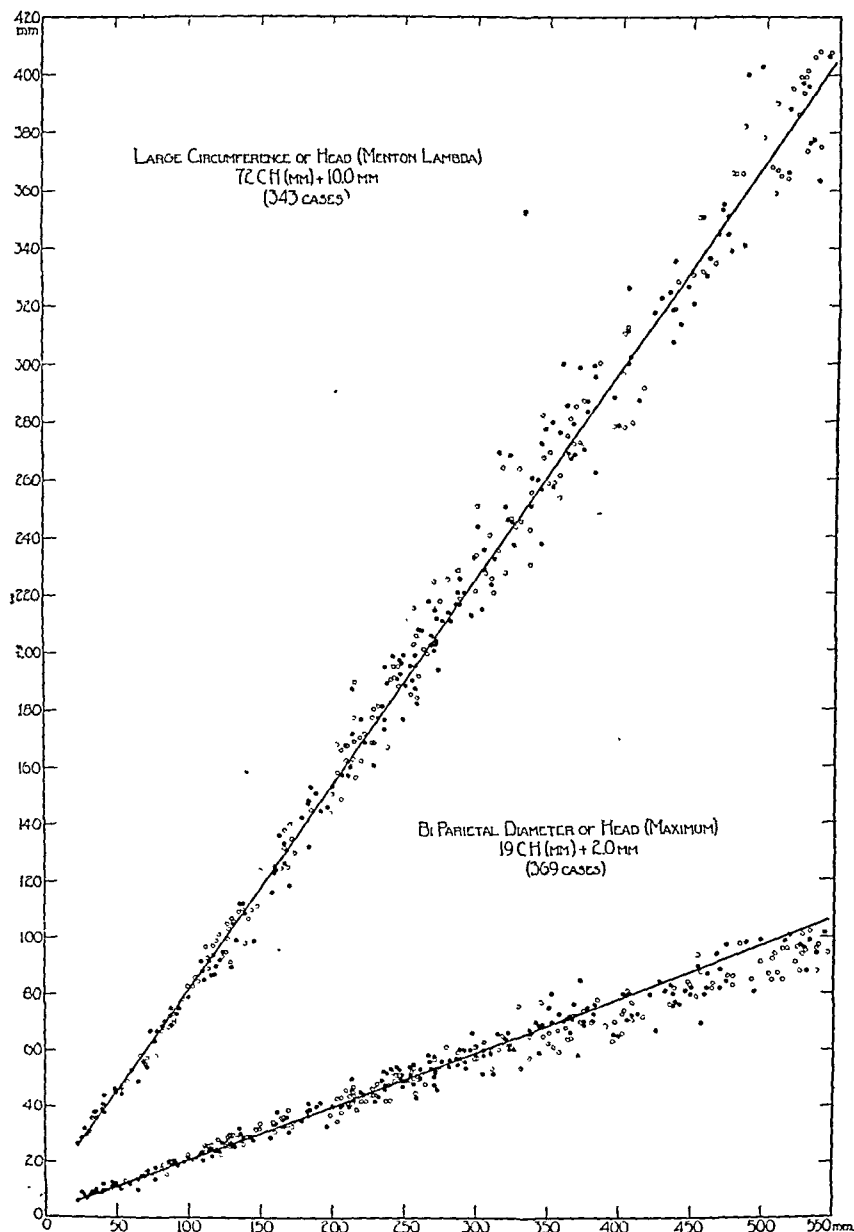


Fig. 6.

curred in that specimen. Only ten fetuses were so studied; but, in view of the almost negative results, such a number of cases is probably sufficient for all practical purposes.

Primary injection, on the other hand, produces a much more notice-

TABLE XIII

	AVERAGE FRESH (MM)	AVERAGE END 6 MOS. (MM)	AVERAGE PER CENT CHANGE
C H	263	261	- 0.8
C R	178	178	- 0.4
O F	65	65	- 1.0
Bi P	49	48	- 0.9
So B	59	60	+ 0.4
S O F	63	64	+ 0.7
O M	62	62	+ 0.1
H H C	183	186	+ 1.4
S O B C	181	184	+ 1.6
S O F C	174	179	+ 2.5
O M C	172	174	+ 1.2
L C	190	190	- 0.3

able change. Here again the immersion, following the injection, produces but little effect. Twenty-six specimens were employed in this study and individual variation, while slightly more marked, was due more to the amount of fluid injected than to any other factor. About 20 per cent of body weight seems to be the optimum amount of fluid to use. The size of the specimens seems to make little, if any, difference in the amount of percentage change produced in the head measurements except that the previous condition, in utero, seems to act as a sort of natural limit to the swelling process. The results of this study are shown in Table XIV.

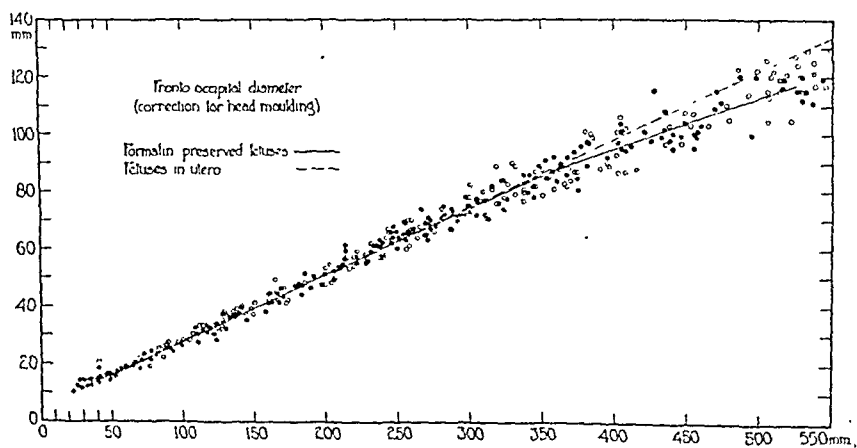


Fig. 7.

While these results show essentially negative changes for body length, they are distinctly positive for the head measurements. If the resulting correction be applied to the original curves for Figs. 1 to 6, the resulting curves would occupy the position shown by the dotted line in Fig. 8. Such a set of curves would properly represent the head proportions for one or several stillborn fetuses.

This injection and preservation study revealed another fact of importance, namely, a peculiar edematous swelling of the tissues of

TABLE XIV

	PERCENTAGE CHANGE FROM INJECTION	PERCENTAGE CHANGE AT END OF 6 MOS. PRESERVATION
C H	+ 1.2	+ 0.8
C R	+ 1.6	+ 0.5
O F	+ 2.6	+ 2.6
Bi P	+ 4.4	+ 3.9
S O B	+ 3.8	+ 3.9
S O F	+ 4.3	+ 4.9
O M	+ 4.8	+ 2.9
H H C	+ 3.8	+ 4.5
S O B C	+ 4.6	+ 4.8
S O F C	+ 5.1	+ 6.1
O M C	+ 7.7	+ 7.4
L C	+ 5.4	+ 5.0

the ischiorectal fossa with a consequent protrusion of the perineum. This protrusion was found to account for the upward deflection in Fig. 1 because the crown-rump measurement had been taken to the perineal surface instead of to the tubera ischii and a technical error thereby introduced. When properly corrected this curve resulted in a straight line, indicated by the straight line in Fig. 1. The fact that injected specimens, in which the effects of birth moulding have been totally or partially obliterated, approach very much more closely to

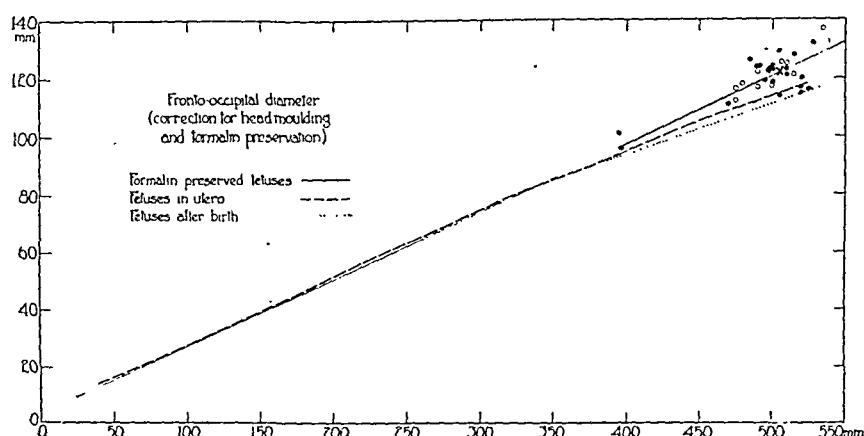


Fig. 8.

a central, straight line than do fresh, stillborn fetuses, suggested the above mentioned study of unmoulded heads. For this purpose babies born by cesarean section, elective, or very early after the initiation of pains, and those born by breech extraction were utilized. Of the total number of these cases (33), twenty-seven were selected as representing full term infants, they having been born within two weeks of term, according to the menstrual history.

The separate readings of this series of measurements appears in

Table XII. These measurements, plotted by the same method outlined above, all fall well above the curve for preserved material (Fig. 8). In fact the average point\* of the 27 selected cases, in the case of each dimension, falls directly (within 1 mm.) in the continuation of the lower straight portion of the curve (broken line Fig. 7 and solid line Fig. 8). We have then, by the removal of artifacts, found that all these "curves" are straight lines. These straight lines are shown collectively in Fig. 9 and individually in relation to the field graphs of preserved material in Figs. 1 to 6 inclusive. This would indicate that the fetal head, in relation to body length, has a perfectly definite rate of growth throughout fetal, not including embryonic, life.

These curves, being straight lines, can be expressed by the formula:  $y = ax + b$  where (y) is any given measurement, (x) the standing height, and (a) and (b) are constants. For the various measurements these formulae are:

Sitting height	.66 (C H)	+ 5.0 mm
Occipito-Frontal Diameter	.235 "	+ 4.0 "
Biparietal "	.19 "	+ 2.0 "
Suboccip'ito-Bregmatic "	.2 "	+ 6.0 "
Suboccipito-Frontal "	.215 "	+ 7.0 "
Occipito-Mental "	.235 "	+ 2.0 "
Horizontal Head Circumference	.675 "	+ 13.0 "
Suboccipito-Bregmatic "	.625 "	+ 16.0 "
Suboccip'ito-Frontal "	.65 "	+ 15.0 "
Occipito-Mental "	.63 "	+ 9.0 "
Large "	.72 "	+ 10.0 "

The constant positive value of (b) in each formula would seem to indicate that, previous to the period at which this study began (23 mm. standing height), the head dimensions gained a certain number of millimeters on the body as a whole, as represented by the standing height, and retained that lead throughout fetal life. This mathematically substantiates our previous ideas of the comparatively early development of the head (Jackson<sup>24</sup>). Similar formulae for other dimensions of the body (as developed in this study) enable one to construct an entire fetus at any period of development, if given any single dimension. Moreover any measurement of the body is just as valuable in determining age as is the standing or sitting height.

From the practical standpoint, one may arrive at the size of the fetal head *in utero* if he can accurately determine the size of any dimension of the body. A moderate number of clinical demonstrations of this indirect method of mensuration have been made and a definite x-ray technic is being developed for this purpose at the present time. Further descriptions of the details of the technic employed and the

\*The average values of fetal head measurements *in utero* present a rather new idea of the size and proportions of the obstetric passenger and are probably of more clinical importance, in some respects, than the postnatal values quoted in the text-books.



results obtained will be given when a conclusive series of measurements has been completed.

### SUMMARY AND CONCLUSIONS

1. Measurements of the head, *in utero*, plotted as ordinates against standing heights as abscissae for any group of Caucasian fetuses, result

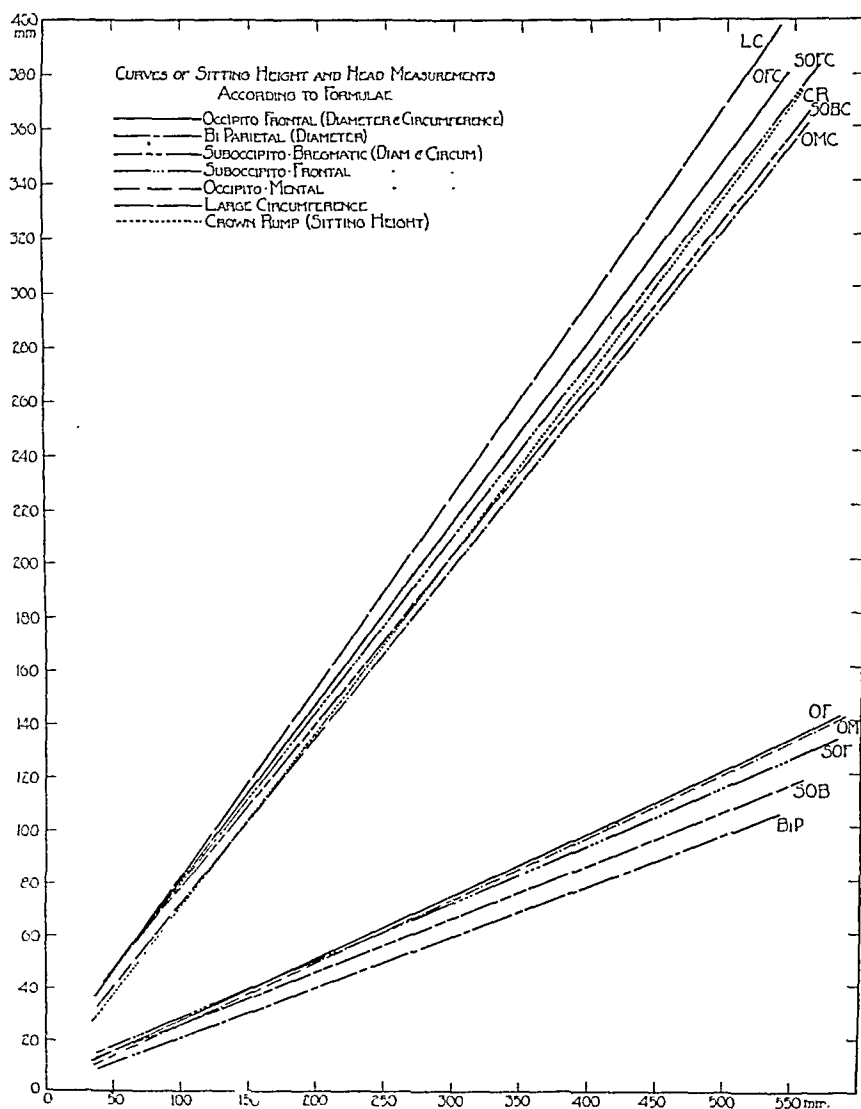


Fig. 9.

in straight line curves. (This is also true of measurements of other parts of the body.)

2. The relationship between any two dimensions can, then, be expressed by the straight-line, empirical formula:  $y = ax \pm b$ , ( $x$ ) and ( $y$ ) being body dimensions, and ( $a$ ) and ( $b$ ) constants.

3. By study of these formulae we find definite mathematical proof of development in the cephalocaudal direction during embryonic life and,

4. A definite rate of growth, in any dimension, established by the third month and maintained throughout the remainder of prenatal life.

5. By the aid of these formulae, one may accurately construct the external body proportions of a fetus at any period of development, if given any single dimension.

6. Likewise, one may deduce the size of the head if one can accurately determine any body measurement *in utero*. A definite technic for this indirect intrauterine cephalometry is worthy of prolonged intensive study. By such a method one could solve problems of disproportion between passage and passenger, as well as determine viability and maturity with a considerable degree of accuracy.

7. Birth moulding probably effects greater changes in head dimensions than ordinarily thought.

8. Fetuses preserved in formalin, by the method outlined, better represent the living fetus *in utero* than any other available type of material.

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## A BRIEF REVIEW OF THE PHYSIOLOGICAL AND EMBRYO-LOGICAL GENESIS OF PSEUDOHERMAPHRODITISM, WITH REPORT OF A CASE\*

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**P**SEUDOHERMAPHRODITISM, while apparently rare in the human, is possibly more frequent in lower animals, cases having been reported in cladocera,<sup>1</sup> crustacea,<sup>2</sup> birds and cattle.<sup>3</sup>

Cattle often deliver themselves of twins. It frequently happens that the female co-twin, the other being a male, is usually sterile and has a modified genital tract resembling the pseudohermaphrodite of the human. These animals are known as free martins and their gonads as free martin gonads.

The structure of a free martin gonad according to Willier,<sup>4</sup> may be any degree of transformation of the ovary into the testicle. This transformation is due to the hormone action of the testes of the male co-twin, when there is a common embryonic or extra-embryonic circulation in utero. These gonads having a varying structure, may show sexual cords exhibiting a series of gradations between medullary cords

\*Read at a meeting of the New York Obstetrical Society, April 11, 1922.

and seminiferous tubules, increase in interstitial cells, transformation of rete in the male direction, by developing connecting tubules between the rete tubules and the seminiferous tubules, arrangement of blood supply form a typical ovarian, to a typical testicular type and lastly they may even develop an epididymis. This in the complete form resembles the testes morphologically, yet is functionally inactive as far as the production of the germ cells is concerned.

A modification of the reproductive system can be produced in chick

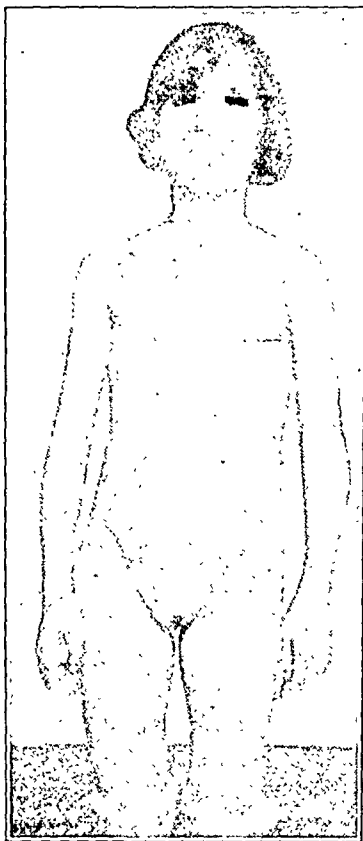


Fig. 1.—Shows male habitus and normal vulva. Picture taken after clitoridectomy was performed.

embryos, by transplanting opposite gonads,<sup>5</sup> showing that the sex hormones play a very important part in the development of this system. In free martin cattle it is the testicular hormone of the male co-twin that influences the gonad development, and it is the internal secretion of this modified gonad that results in the development of an atypical genital tract in the female co-twin. Atypical gonad development in the human pseudohermaphrodite cannot be explained on the basis of the hormone action of a male co-twin, but knowing that sex determination is transmitted through the primary germ cell; is it not possible that this sex determination for some unknown reason is perverted, and that this perversion is inherited?

This inheritance is very suggestive in my case, which is as follows:

E. P., age fourteen, born in the United States. Chief complaint: Headaches and weakness for nine weeks. Masturbation since infancy. Family history: Father living and well. Mother has tuberculosis. *Two aunts on the father's side are known never to have menstruated or borne children and had no mammary development.* Past history: Measles in infancy; no other illness or operations. Personal history: Mental development is retarded; is only in the sixth school grade. Menstrual history: Has never menstruated. Present illness: As long as patient can recollect, she has had headache daily, usually starts on awakening and lasts for a good part of the day; is throbbing in character and is associated with nausea and vertigo. Has had two convulsions in the last month during which she was unconscious for three minutes. Has lost 10 pounds in nine weeks. Physical, general: Underdeveloped child; no mammary development; harsh voice; male habitus. (Fig.



Fig. 2.—Shows large mass at site of clitoris—and prominence of right labium majus, due to presence of gonad.

1) Local physical: At the site of the clitoris there is a large mass (Fig. 2) consisting of two corpora spongiosa and glans covered by foreskin. Rest of vulva normal; vaginal cavity ends blindly. Uterus, tubes and ovaries could not be felt by recto-abdominal examination under anesthesia. In right labium majus is a small oval mass the size of a lima bean, presumably a testicle. (See prominence of right labium in Fig. 2.) Diagnosis: Pseudohermaphroditism, complicated by epilepsy. Operation: Separation of foreskin was attempted but was not feasible and a clitoridectomy was performed by Dr. S. Wiener. Postoperative course: The wound healed per primum, and the vulva resembled that of the normal (Fig. 1). Patient was transferred to the Neurological service for the treatment of her epilepsy. Laboratory findings: Wassermann negative. Surgical pathology: tissue removed consists of erectile and fibrous tissue containing nerves, covered by normal squamous epithelium.

In identifying my case I have followed Neugebauer's classification which is as follows:

- I—Hermaphroditismus verus (truly bisexual, very rare)  
 II—Pseudohermaphroditismus (sex organs of one type associated  
     with sex organs of the opposite type)  
     a—Internus (Masculinus)  
         (Feminus ) Int. organs opposite  
     b—Externus (Masculinus)  
         (Feminus ) Ext. organs opposite

My case can be classified as one of *pseudohermaphroditismus feminus externus*, as the external female organs are present and normal except for an overdevelopment of the clitoris. Internally there is a gonad in the right labium majus presumably a rudimentary testis, possibly to be classified as similar to a free martin gonad of cattle. The uterus, tubes and ovaries are apparently absent.

According to Neugebauer,<sup>6</sup> who collected 910 cases of hermaphroditism, there were 722 of the male variety and 188 of the female. Six hundred thirteen of the whole series were of the pseudohermaphroditismus masculinus externus type, that is they had external male genitals, with internal female sex organs. Most of these cases had ovaries, uteri or tubes in a hernial sac.

Embryologically the anomalies of the genital tract can be explained by a brief review of the development of this tract. During the period of mesonephric development, the human embryo is bisexual, containing all structures necessary for the development of both sexes. About this time there develops a ridge along the border of both mesonephra which gives rise to the müllerian ducts.<sup>7</sup> The primitive urogenital or wolffian ducts lie external to these but both empty together into the urogenital sinus. As sex differentiation takes place when the embryo is about 4 cm. long, corresponding with the beginning differentiation of ovaries or testes, these tubular structures become differentiated as follows:

The wolffian ducts disintegrate leaving only a small portion, which in the male forms the epididymis, seminal vesicles, conivasculosi, the vasa efferentia and ejaculatory duct. In the female it forms the paroophoron, the duct of Gärtner and the parovarian or organ of Rosenmüller. The müllerian ducts in the male involute in the eighth week, the rudiments remaining as utriculus masculinus and hydatid of the epididymis. In the female they continue to develop, fuse anteriorly to form the tubes, posteriorly to form the uterus and vagina. Incidentally it is this posterior fusion which when incomplete or absent gives rise to uterus bicornis, didelphus, septate or double vagina.

In our case during embryonal life, an atypical male gonad developed in all probability and descended through the inguinal canal into the labium majus. A posterior fusion of the very lowest or caudal ends of the müllerian ducts gave rise to a vagina. Whether or not the wolffian

ducts developed an epididymis and vas deferens cannot be stated definitely.

From the urogenital sinus dates the development of the vulva, bladder and urethra.<sup>8</sup> In the indifferent embryo there develops a genital tubercle, a ridge and two grooves from this sinus. The tubercle is the *anlage* for the clitoris or penis. The ridge forms the labia minora or the anterior urethra in the male. The urethra of the female comes directly from the sinus which is the posterior urethra in the male. The grooves grow towards each other fusing in the male to become the scrotum and in the female remain unfused as the labia majora. The clitoris *anlage* grows very slowly and droops caudad while the rest of the vulva grows rapidly, giving eventually a relatively small organ covered by a reflection from the labia minora. The penis *anlage*, however, develops faster in an anterior direction.<sup>9</sup>

In this case there was a normal development of the urethra and vulva but an overdevelopment of the clitoris *anlage* in an anterior direction as occurs in the male.

The reason for the atypical development of the genital tract in my case is possibly due to the hormone action of an atypical gonad, whether or not this gonad would resemble a free martin gonad as described I am unable to state as we did not obtain permission for its removal and consequently it could not be studied.

#### CONCLUSIONS

1. Pseudohermaphroditism can be experimentally produced and explained in animals.
2. Some animal pseudohermaphrodites have free martin gonads.
3. Sex hormones probably determine the development of the genital tract.
4. Something transmitted through the primary germ cell determines the development of the normal gonad.
5. This influence may be perverted and as in my case this perversion may possibly be inherited.
6. The gonads in human pseudohermaphrodites are possibly free martin gonads.

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## PREOPERATIVE DIGITALIZATION. A METHOD TO REDUCE POSTOPERATIVE COMPLICATIONS\*

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NEW YORK CITY

POSTOPERATIVE complications, especially those involving the respiratory tract have always caused the surgeon considerable anxiety. In spite of improvements in the methods of administering anesthesia, careful pre- and postoperative care, the refinement of operative technic and the rapidity of operative procedures, we have been apparently unable to reduce the number of such cases materially.

Cutler, working with Morton and Hunt, and Whipple, who have done considerable work recently, especially with the purpose of limiting these pulmonary complications, have not been able to reduce the incidence of these serious postoperative effects to any great degree.

One may for purposes of classification group postoperative complications under two large headings,—vascular and nonvascular. Under vascular complications, the pulmonary group are most important. Pulmonary complications in almost all instances are dependent on postoperative vascular conditions. We are all familiar with the so-called hypostatic pneumonia either terminal or in the course of some chronic disease. \*This condition is due entirely to circulatory stasis, with poor aeration, on which is superimposed an infection. Pulmonary edema is another well recognized postoperative lesion of vascular origin.

Polak has recently studied the importance of maintaining the blood pressure in operative conditions. The pressure, especially the pulse pressure, he feels, is an important factor in determining the postoperative course of the patient.

His curve (average) is given in Fig. 1. The average drop in pressure (postoperative) at the end of one hour was 14.2 mm. The return to normal was usually accomplished in 24 hours.

A. H. Miller notes the same fall in pressure immediately following operation. In our series we have carried on readings similar to Polak, with practically complete parallelism. In one case, however, where the preoperative pressure was 220 systolic, 180 diastolic, with evidences of marked nephritic changes, the pressure dropped to 110 and then gradually rose to 140 on the day following operation. In six days the pressure was practically at the preoperative level of 220. We all have noted the fall in pressure following operation, due usually

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\*Presented at a meeting of the New York Obstetrical Society, April 14, 1922.



to diminution of cardiac efficiency, and it is this fall in pressure that results in stasis in the smaller arterial and venous radicles. The first 24 hours after operation, in all probability, determine to a great extent, the pneumonic or other vascular complications. We have mentioned the so-called hypostatic pneumonia and we feel that practically all postoperative pneumonitis has an analogous etiology. The other pulmonary complications, embolism or thrombosis may be grouped under vascular lesions but just how much they are influenced by a maintenance of the pressure level can only be judged after observations on a very large series of cases. Phlebitis is occasionally due to trauma during the operation, but usually it is due to stasis and infec-

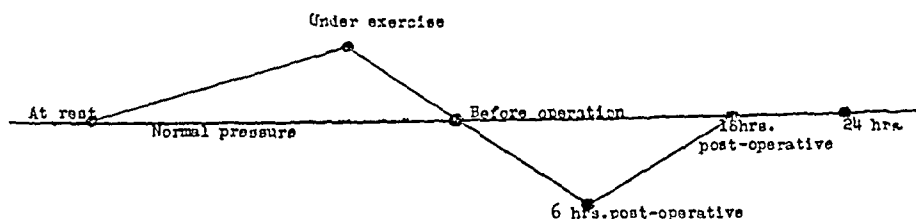


Fig. 1.—Blood pressure curve usually seen in operatives. (Polak's curve, undigitalized curve.)

tion and it too may react favorably to an improvement in the cardiovascular activity. Postoperative shock is still an unsolved problem, but we know that there is a marked fall in pressure in these cases of shock, just as in other postoperative conditions. If the pressure can be maintained either partially or totally, the shock will be very much

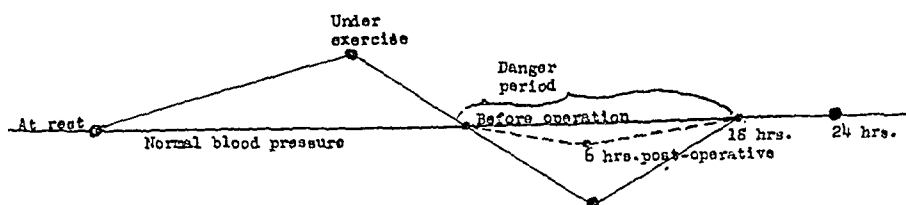


Fig. 2.—Comparison of digitalized and undigitalized postoperative blood pressures. Note comparatively negligible drop during danger period in digitalized cases.

----- Digitalized.  
 ————— Undigitalized.

lessened. The asthenia seen following operations, where there is no source of septic absorption, is always associated with a low pressure, but here cause and effect must be closely differentiated.

With the above in view it is reasonable to assume that any measure which will help to maintain the pressure, and especially the pulse pressure, would also be of value in reducing the incidence of the complications dependent on vascular disturbances. We decided that digitalis, or any of its derivatives, being powerful cardiac stimulants would be of value, and a series of operative cases was investigated to determine the value. These cases were grouped in three divisions.

In one division the cases were digitalized by a method that we termed the "*rapid method*." The tincture of digitalis (standardized) was given as follows: 0.15 c.c. per lb. of body weight of patient was the total amount used. One-half of this was given 24 hours before operation, one-fourth six hours later, and the remainder six hours after the second dose. The pressure and electrocardiogram was taken on the morning of the operation, the pulse rate and quality and general condition also being noted. The cases used were picked at random and usually the poorer operative risks were selected for digitalization.

The method of standardization was by the so-called "cat unit" method of Eggleston. By cat unit is meant the amount of a digitalis preparation "necessary to kill one kilogram of cat" when injected intravenously slowly and continuously. This is expressed in milligrams of the preparation. Experimentally 0.148 "cat unit" per pound is necessary for full digitalization.

In addition to the rapid method there were two other groups, one digitalized by the "slow method" to be described later and a control group.

The method of selection was quite arbitrary. Cases were picked at random for all three groups with a tendency however to relegate the poor risks to the groups for digitalization. In other words the controls were run under similar circumstances in every respect,—anesthetist, anesthesia, operating room temperature, technic, etc.

The second method of digitalization, the slow one mentioned above, was less heroic. The dosage was smaller, and a preparation other than the tincture was used. Digitan in one and one-half grain doses was given by mouth every two hours for six doses commencing 24 hours before operation. On the morning of operation two more such doses were given. In comparing the two methods we feel that there is much to be said for both, but for general routine work the second is probably the better. Similar results were obtained by each method but there was less tendency towards digitalis nausea and vomiting with the slow method of administration. The doses were also smaller and the exhibition of the drug much easier. One and one-half grain of digitan equals 15 c.c. of the standardized tincture.

To determine the action of the digitalis on these apparently normal hearts, two methods were used, the electrocardiograph and the pulse rate. We can fully agree with White and Sattler who found that increased conduction time was a very important indicator of complete digitalization. The earliest indication of digitalis action however was the decrease of the amplitude of the T-wave in all leads, going on to reversal or inversion of the T-wave when complete digitalization is obtained. The blood pressure was uninfluenced. The pulse rate showed no appreciable change in the cases with normal hearts. The

electrocardiograph was usually taken about two hours before operation. The blood pressure readings were taken on admission, ante- and postoperatively, at 6, 12 and 24 hours to conform to Polak's technic for comparison.

The types of cases operated upon embraced practically all of the more severe gynecological and general surgical procedures. We attempted to use only the more severe cases, i.e., those requiring laparotomy, for digitalization. Using the "rapid method" we digitalized 27 cases.

TABLE I  
TYPES OF CASES DIGITALIZED BY "RAPID METHOD"

Hysterectomy	10
Ectopic	2
Plastic, interposition	1
Cervical amputation (very poor risk)	1
Myomectomy and ventrofixation	1
Curettage (cardiac and tbc.)	1
Ovarian tumor	1
Diseased adnexa	1
Plastic, ventrofixation and ligation of tubes	1
Cholecystectomy	4
Thoracotomy	2
Nephrectomy	2

Among these the anteoperative condition was good in fourteen, fair in three and poor in ten, due to cardiac conditions, emaciation, myocarditis, emphysema, bronchitis and associated lesions. The anesthesia (gas and ether) was uneventful in all the cases. The immediate postoperative examination showed good, full, slow, regular pulses. The color remained good in all except in one instance where there was a previous emphysema and bronchitis. In 58 per cent of these cases there was no immediate postoperative vomiting or nausea. In 23 per cent there was nausea and in 19 per cent only was there vomiting. Of these one case showed true digitalis vomiting, the others were so-called "anesthesia vomiting." Very interesting was a delayed reaction seen in about 30 per cent. In this group vomiting occurring once or twice on the second and third day; in all probability this was a digitalis effect. All the possible causes of postoperative vomiting, such as gastric dilatation, etc., were ruled out. All of the digitalized cases regained their consciousness with complete orientation and very rapidly. Few showed the mental aberration seen so commonly. The postoperative recovery was unusually rapid.

The blood pressure was studied carefully on a majority of these cases. The postoperative drops averaged only 3 mm. within the first 12 hours; after that the tension became normal.

The complications in this group were limited to one case of bronchitis which was of two days' duration and was probably a direct

ether result. There were none of the severe pulmonary complications or vascular lesions that one encounters in a group of operated cases.

Forty-two cases were digitalized by the slower method using digitan gr.  $1\frac{1}{2}$  every two hours for 6 doses, commencing 24 hours before operation and giving two additional doses in the morning of the operation.

TABLE II  
TYPES OF CASES DIGITALIZED BY "SLOW METHOD"

Hysterectomy	15
Plastic, etc.	1
Plastic and Moschcowitz operation	1
Diseased adnexa	1
Therapeutic hysterotomy	1
Alexander (poor risk)	1
Ovarian cyst	2
Appendectomy	1
Myomectomy, bilateral salpingo-oophorectomy	2
Thoracotomy	8
Cholecystectomy and exploratories	6
Nephrectomy	3

Of these forty-two, eight were in very poor general condition: hypertension with renal disease and myocarditis, tuberculosis, mild uremia (nephrectomy 10 years ago) and asthenia. Postoperative the pulse was excellent in all cases except the one who had a hypertension and a myocarditis with a preoperative pressure of 220. In this case the pulse was slightly irregular but it was of fair quality. This case also had an immediate postoperative drop of pressure to 110 which gradually rose to the preoperative level after a few days. The color was good in all the cases. In 63 per cent there was no vomiting; 24 per cent had the usual ether vomiting and 13 per cent had only nausea. One case showed vomiting in small amounts for three days. There was a delayed reaction in 15 per cent of the cases i.e., vomited two or three days later, probably a digitalis effect. The average drop of pressure in these cases was 5 mm. These cases also showed electrocardiographic evidence of complete digitalization even though the total amount of digitalis was much less than that exhibited by the first method. The complications in this group consisted of one case of bronchitis lasting one day, probably irritative in cause.

We can sum up these two groups by saying that there were practically no complications. The postoperative course was excellent and there were no pronounced ill effects from the digitalis. The blood pressure drops were minimal, the pulse pressure being maintained throughout.

There were thirty-nine undigitalized cases, all in good condition before operation except three.

One of these three had a myocardial weakening, one was asthenic

TABLE III

UNDIGITALIZED		COMPLICATIONS
Hysterectomy	11	1 pneumonia, 1 shock
Ovarian cyst	1	
Plastic	7	1 pneumonia and 1 phlebitis
Partial bilat. oophorectomy	1	
Retained placenta	1	
Ectopic	1	1 shock
Hysterotomy	1	
Amp. of cervix, ligation of tubes	1	
Alexander-appendectomy	1	Bronchitis
Plastic on tubes	1	Bronchitis
Appendectomy	1	
Explor. lap.	1	
Carcinoma fundus	1	
Hernia (local)	1	1 pneumonia
Appendices (acute)	3	1 pneumonia
Cholecystectomy	3	1 pneumonia
Nephrectomy	3	1 pneumonia-suppurative bronchitis.

and the other was anemic. Postoperatively, 30 per cent of these had a poor pulse; two cases developed such a poor, weak, irregular pulse that hypodermic stimulation with a digitalis preparation had to be used. Fifteen per cent showed poor color, either pallor or cyanosis. Fifty-seven per cent vomited several times; 43 per cent did not vomit or had only nausea. The alertness seen in the digitalized cases was lacking, instead the usual postanesthetic mental aberration was the rule. The rapid recovery seen in the digitalized cases was also missing in the greater portion, and the asthenic condition of some of the patients was quite striking, when compared to the digitalized cases, who had had similar operative procedures. The average pressure drop was 14 mm. taken at intervals of 6, 12, and 24 hours postoperatively, compared to the 3 and 5 mm. drop of the digitalis cases. This curve parallels the one obtained by Polak and shown above.

The most interesting facts are presented by a perusal of the complications.

TABLE IV  
COMPLICATIONS

## RAPID METHOD

1 bronchitis (ether) 2 days' duration

## SLOW METHOD

1 bronchitis (ether) 1 day duration

## UNDIGITALIZED

6 pneumonia

2 bronchitis

2 shock

1 phlebitis

There were six cases of pneumonia, the diagnosis corroborated by the attending physician, a total of 15 per cent, two cases of shock,

two cases of bronchitis and one case of phlebitis. The total percentage of complications is 27 per cent in these undigitalized cases, compared to the zero percentage of complications if one excludes the two very mild bronchitis cases seen in the digitalized groups. This is the most important and the outstanding feature of this series of experiments.

With the above in mind a careful search of the literature was made, but in no case were we able to find any reference to methodical digitalization with the possible exception of Mandl's work. Using an intramuscular injection of a digitalis preparation in comparatively small doses, he was able to obtain a reduction of postoperative complication from 27 per cent to 8 per cent. Whipple used the tincture preoperatively, but the doses were quite small and the tincture was apparently not standardized.

Lilienthal in an editorial article published in the *International Journal of Surgery* in 1907, suggested the administration of digitalis or strophanthin 24 hours before operation, in nervous persons, even if they have sound hearts; and in an article published in the *Annals of Surgery* for March, 1922, he states, (p. 259) in discussing cases of poor surgical risk for lung resections, that "In any event digitalization should be accomplished the 48 hours preceding operation."

Summing up the observations made in the three groups of cases we must be impressed by the fact that in the digitalized cases the pulmonary complications have been definitely lower, that other annoying and at times serious complications have also been minimized and that the method used to obtain these results is free from danger to the patient and is easy of administration.

Of the two methods of digitalization it seems that the slower method, using digitan, has the advantage of ease of application and also is less likely to produce even temporary, unpleasant digitalis effects.

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(For discussion, see p. 189.)

## REFLEX GASTRIC SYMPTOMS IN DISEASES OF THE FEMALE PELVIC ORGANS

BY ALBERT F. R. ANDRESEN, M.D., F.A.C.P., BROOKLYN, N. Y.

IT IS a well-known fact that disorders of the female pelvic organs are able to cause at times quite marked gastrointestinal symptoms, but this fact seems to be frequently overlooked, as evidenced by the large proportion of patients treated for "dyspepsia," "indigestion," and other similar vague conditions, without being examined to rule out pelvic diseases a cause for the digestive symptoms. In the Gastrointestinal Department of the Brooklyn Hospital Dispensary, out of a total of fifteen hundred carefully studied cases applying at the clinic for relief from gastrointestinal symptoms, two hundred and sixty, or 17.3 per cent showed female pelvic trouble as the sole or as the underlying cause of these symptoms. One thousand of the whole number of patients in this series were women, so that the incidence of female pelvic disease as the cause of digestive disturbances among women was over 25 per cent. In other words, one out of every four women who thought they had "stomach trouble" was really suffering from pelvic disturbance with secondary gastric symptoms. Being loath to make a diagnosis of reflex disturbances, the writer made sure that in each of the cases of this series all diagnostic methods were made use of to rule out organic gastrointestinal disorders before a diagnosis of this kind was definitely accepted, and the large percentage of this type of cases was a cause of considerable surprise in preparing this article.

The factors producing the gastrointestinal symptoms vary. There may be an actual infective lesion of the digestive tract, such as peptic ulcer, appendicitis or gall-bladder disease; proceeding from the pelvic infection as a primary focus. In the present series sixty cases were undoubtedly of this variety. The title of the present paper does not include this type of case, so that the writer will deal entirely with the much more numerous cases with so-called reflex gastrointestinal symptoms, where no lesion of the digestive tract can be demonstrated. Two hundred cases in this series were of this type. In these cases the symptoms may be caused by any or all of the following factors:

1. Reflex irritation through the sympathetic nervous system, the fibers of which, supplying the abdominal and pelvic organs intermingle in such a way that disturbances in one part may easily be reflected by symptoms in another.

2. Disturbances of the endocrine system, especially of the thyroid,

pituitary and adrenal glands, secondary to disturbances in the ovarian secretion.

3. Irritation of any part of the digestive tract coming into direct contact with, or becoming adherent to, the pelvic organs.

4. The reflex symptoms may also be aggravated in some cases by the occurrence of a general visceroptosis, produced in part by the failure of the normal support given by the pelvic organs, due to displacements or prolapses, and occasionally as a result of the weakening of the abdominal wall by insufficient prophylaxis in the way of abdominal gymnastics in the puerperal period.

A study of the relative frequency of the different types of pelvic disorders predominant in the two hundred cases embracing this study, shows that cases of versions and prolapses numbered 66, or 33 per cent, pelvic tumors 22, or 11 per cent, lacerations and erosions of the cervix 16 or 8 per cent, pregnancy 34 or 17 per cent, and menopause 32 or 16 per cent. Thirty, or 15 per cent of the cases had had pelvic operations performed at some previous time, the gastrointestinal symptoms having been produced or aggravated thereby.

The character of the reflex gastrointestinal symptoms in these cases varied greatly, even in the same patient at different times, and this variation in itself often gave a clue to their reflex origin. In a general way, gastrointestinal symptoms may be considered as probably reflex in origin if they present the following characteristics:

1. Irregularity, attacks occurring at irregular intervals, with periods of entire absence of symptoms, and great differences in the character of the symptoms at different times.

2. Influence by psychic disturbances, attacks being often precipitated by annoyance, anger or sorrow, and relieved by joy or religious exaltation.

3. The observation that factors usually producing an influence on the gastrointestinal tract will have no effect on the symptoms, as, for instance, the time of eating, the quality and quantity of the food taken, rest in bed, local application of heat or cold, bowel movements or enemas.

4. The association of various other reflex nervous symptoms, such as headaches, varying in location and degree, insomnia or somnolence, irritability, hysteria or vaso-motor disturbances.

The types of reflex symptoms occurring in this series of female pelvic disorders may be grouped as follows:

1. *The dyspeptic symptoms*, which occurred in over 80 per cent of all cases, are the result of reflex hyperacidity, hypersecretion, or achylia, and often of cardiospasm or pylorospasm, and consist of belching, sour eructations, nausea or vomiting, epigastric fulness, distress or pain, a few or all of these symptoms commencing at irregular times, usually



after meals, although often not affected by food, and lasting for variable periods. The appetite may be variable, periods of voraciousness succeeding periods of absolute anorexia. The vomiting, if it occurs, is usually sudden, and as a rule not very exhausting to the patient unless it has continued for a long time. It may follow closely the ingestion of food, or may occur later, although not influenced by the character or the amount of the food ingested. A suggestive point may be that, in spite of the vomiting, the patient may not lose much weight or strength even over long periods of time, although in some cases marked prostration or even acidosis may occur.

2. The symptoms may be *cyclic* in character, occurring at the menstrual periods, or at the time when menstrual periods would be expected, this type being seen in young women with uterine displacements, in pregnancy or at the menopause. The symptoms are of the dyspeptic type described above. In the present series only two per cent showed this type of symptoms.

3. *Pressure symptoms*, caused by displacements of the pelvic organs, or by enlargements as a result of pregnancy, new growths, or inflammation, consist of constipation, colon spasms and reverse gastrointestinal peristalsis, resulting often in persistent vomiting. Four per cent of the cases showed pressure symptoms.

4. *Irritative symptoms*, caused by the proximity of the digestive tube to the diseased pelvic organs, include diarrheas, mucous colitis, sigmoiditis, and spasm of the sphincter ani, often resulting in anal fissures or hemorrhoids. They occurred in ten per cent of the series.

The findings on examination are usually sufficient to establish a diagnosis. The general appearance of the patient will help to suggest the type of the trouble—the chlorotic young girl will suggest the dysmenorrhic type, the harassed young woman, the infective or the postpartum type, the middle-aged neurotic, the catamenial type. The general symptoms of anemia, chronic sepsis or of endocrine disturbances may be present. The reflexes may be exaggerated.

Abdominal examination may disclose general or localized hyperesthesia or anesthesia, and there may or may not be real tenderness in the lower abdomen, the flanks or in the epigastrium, the epigastric tenderness being due to hyperexcitability of the celiac sympathetic plexus as a result of the pelvic irritation.

Vaginal examination will disclose the cause of the difficulty, and should be thorough, the bimanual method being supplemented by the use of the speculum wherever possible. A pelvic disorder having been definitely ascertained to be present, it is then necessary to establish this as the sole cause of the gastrointestinal symptoms by ruling out organic lesions of the gastrointestinal tract and, if possible, to elicit some sign characteristic of pelvic reflex disturbances.

The Roentgen ray examination of the gastrointestinal tract will in most cases determine whether there is a lesion present, but a negative report is of course of less value than a positive one. In purely reflex cases a condition of hyperperistalsis may be found along the entire

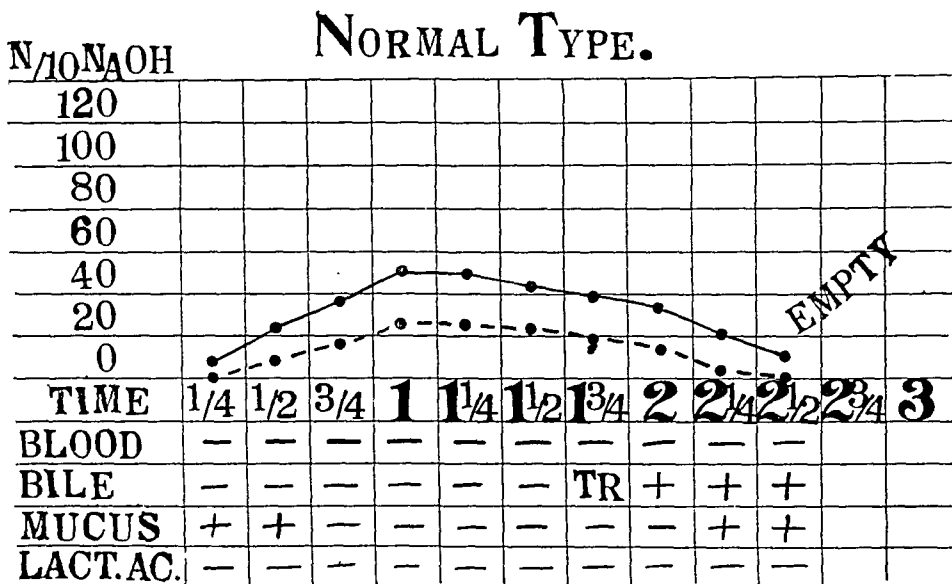


Fig. 1.

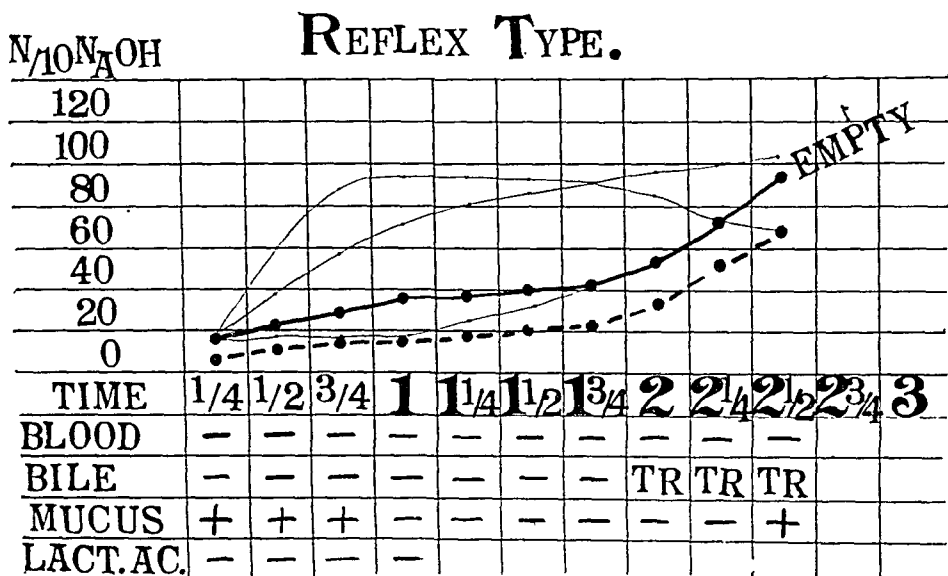


Fig. 2.

tract, and spasms may occur at the cardia, pylorus or along the colonic tube.

The examination of the gastric contents by the older methods is of little value, except in cases where a marked hyperacidity or an achylia

is found, when a suspicion of a reflex disturbance may be entertained. The findings on fractional examination are, however, of the utmost significance. In old chronic infective pelvic troubles, and at the menopause, there may occasionally be found a true achylia gastrica (this occurred in 15 per cent of the cases in this series), but the rule in practically all other cases is the finding of a curve of the reflex type described by the writer in previous communications. This type of curve was found in over 80 per cent of the cases in this series, a normal curve being found in only 4 per cent. By the fractional method, it will be noted, specimens of the gastric contents are removed at fifteen minute intervals after a cracker and water test meal until the stomach is empty, or at least for two hours after the ingestion of the test meal. The specimens are separately titrated, and curves of free and total acidity are plotted out on a chart, as shown in Fig. 1. The characteristic of the reflex curve is that, instead of sloping downward toward the zero point during the second hour, as shown in Fig. 2 (normal curve), it shows a tendency to rise steadily, or at least to be sustained at the one hour point for the remainder of the two hour period. This type of curve is seen practically only where there is an actual lesion in the abdomen, outside the stomach, causing reflex irritation of the stomach, and resulting in a hypersecretion, most often of a hyperacid gastric juice. It occurs in duodenal ulcer, but is then excessively high, and associated with the appearance of bile and blood in the stomach contents simultaneously. It is also seen in early gall-bladder and in appendiceal lesions, and in kidney, bladder and colon infections, all of which must be ruled out where the curve is found.

To make a diagnosis, therefore, of gastrointestinal symptoms occurring reflexly as a result of female pelvic disorders alone, the following points must be determined:

1. The irregularity of the symptoms, their influence by psychic phenomena, and their lack of influence by normal stimuli.
2. A negative Roentgen ray examination, except perhaps the occurrence of hypermotility or of spastic conditions.
3. The ability to rule out other lesions of the abdominal organs as a cause of the symptoms.
4. The finding of the reflex type of curve on fractional examination of the gastric contents, or, occasionally, of an achylia gastrica.
5. The finding of pelvic pathologic lesions.

The *treatment* of reflex gastrointestinal irritation from disease of the female pelvic organs demands:

1. The correction, and, if possible, the removal, of the pelvic trouble, or the proper management of pregnancy or the menopause.
2. Attention to the endocrine disorders—the use of ovarian, thyroid, adrenal or other derivatives, as indicated.

3. The choice of a diet which shall be soothing, nonputrefactive, possessed of a high nutritive value, and rich in vitamins.

4. Symptomatic treatment of any of the severer gastric symptoms.

5. Attention to the colonic function, not by the administration of irritating or depleting cathartics, but by the use of soothing measures, such as agar, mineral oil or oil enemata.

6. The use of nerve sedatives and antispasmodics for a time, if indicated. Atropine to physiological effect, and bromides, are of considerable value in many cases, but should only be given where indicated.

7. The use of antacids is rarely indicated, but occasionally a little sodium bicarbonate or magma magnesia may prove to be of benefit for a time. Calcium lactate, in ten grain doses, three times daily, after meals, is a good antispasmodic and a mild antacid.

8. General hygiene and the removal of infective foci in any part of the body, with the idea of building up the patient's recuperative power, is a valuable adjunct to treatment, as is attention to correction of faulty posture and visceroptosis.

9. Rest, the degree to be determined by the severity of the symptoms, is imperative in all cases. Definite hours for rest and recreation should be prescribed. Correction of bad habits in regard to sleep, the sexual function and mental excitement should be undertaken.

The one symptom most often requiring especial care because of its severity, is the persistent vomiting occurring during the early months of pregnancy and often also in other forms of pelvic disorder. This annoying, and sometimes serious, symptom, can, in the writer's opinion, be best taken care of as follows:

1. Gastric lavage, either by the stomach tube or by the administration of hypertonic salt solution to induce vomiting, or transduodenal lavage through a duodenal tube, will usually check the severer spasms of vomiting. Between lavages, feedings should be given, and, if vomited, should be followed immediately by another lavage. In stubborn cases, duodenal feeding may be attempted.

2. The diet should consist at first of milk, six ounces, with lactose or malto-dextrin foods, one-half ounce, given at first every two or two and one-half hours, with the gradual addition of cereals, puddings, custards, eggs, bread, crackers, etc., during the following week or ten days, and then the cautious addition of fruit and vegetables. No meat should be given for at least a month to avoid any possibility of toxemia from protein decomposition.

3. Ovarian extract, either the whole gland or the corpus luteum, in large doses or, preferably, in the minute doses as recommended by Fränkel, can be prescribed, and may have considerable value.

4. Calcium lactate, in ten grain doses, three times daily, well diluted, is of value, both as a nerve sedative and as a mild antacid.

5. Attention to the bowels, by the use of mineral oil in one-half ounce dose at night, and also the administration of granulated agar, one heaping tablespoonful with breakfast, will be indicated in most cases, and may be supplemented by warm oil enemas, five ounces, to be retained, each night, if necessary.

#### CONCLUSIONS

1. Female pelvic disease as a cause of reflex gastrointestinal symptoms is frequently overlooked.

2. No female patient should be treated for gastrointestinal symptoms until careful pelvic examination has been made.

3. Before making a diagnosis of reflex symptoms from the pelvis, organic disease of gastrointestinal tract must be definitely excluded.

4. In addition to care of the pelvic condition the gastrointestinal symptoms require individual care.

88 SIXTH AVENUE.

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### ECTOPIC PREGNANCY

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WHILE the writer was engaged in studying the cases of ectopic pregnancy treated at the New Orleans Charity Hospital during the years 1906-1919 inclusive, three similar studies were published: one at Johns Hopkins, by Dr. H. M. N. Wynne, published in the *Johns Hopkins's Hospital Bulletin*, January, 1919; another that of the cases treated at the Woman's Hospital in New York, by Dr. Lilian K. P. Farrar, published in the *American Journal of Obstetrics*, June 1919; and the third that of the cases at the Cook County Hospital, by Dr. Henry F. Lewis, published in the *Illinois Medical Journal*, May, 1920. I have received many valuable ideas and suggestions from each of these articles, and it has occurred to me that a comparison of the figures and conclusions presented therein, with the results of my own study, might be both interesting and illuminating, for, as Dr. W. J. Mayo, in a recent article, in quoting Dr. Moynihan says: "Statistics can be made to tell anything, even the truth."

In the years under consideration, 1906-1919, 221 cases were filed as extrauterine pregnancies in the Charity Hospital records. Thirty-five cases, however, have been disregarded for the purposes of this paper. Some of the patients deserted before more than a tentative diagnosis could be made. One case was filed incorrectly. In the remainder of the cases the clinical evidence was so strong that the

diagnosis of ectopic was in all probability correct, but the patients refused operation and therefore the diagnosis was not confirmed. Two cases included in the summary were not operated, as the condition of the patients on admission was such that surgical intervention was absolutely contraindicated. In one of the cases, partial autopsy confirmed the diagnosis and, while no autopsy was held in the other case, there could be no reasonable doubt but that the diagnosis was correct.

During these fourteen years, 17,734 patients were admitted to the various gynecologic services of the Hospital, and, as stated above, 186 were cases of ectopic pregnancy, an incidence of approximately 1.05 per cent. The incidence for the Cook County Hospital is not stated; for Johns Hopkins Hospital it is 303 to 22,688, or 1.3 per cent, covering 27 years; for the Woman's Hospital it is 309 to 19,674, or 1.5 per cent, covering ten years. It will be noted, then, that the incidence is practically the same in all cases.

TABLE I

YEAR	NO. OF PATIENTS	YEAR	NO. OF PATIENTS
1906	4	1913	8
1907	5	1914	18
1908	14	1915	12
1909	9	1916	32
1910	7	1917	22
1911	11	1918	19
1912	7	1919	17
Total			186

The race is noted in 179 cases; 92 patients were white women, or 51.3 per cent, and 80 were negroes, or 48.6 per cent. Only in the Johns Hopkins' report is the race stated; 202 of the patients were white women, or 66.66 per cent, and 101 were negroes, or 33.33 per cent. It will be noted that in both studies the incidence was found to be greater among the white women.

In this series the age was recorded 182 times. The youngest patient was 17 and the oldest 48. At Johns Hopkins the youngest patient was 15, the oldest 45; at the Woman's Hospital the youngest patient was 17, the oldest 42; in the Cook County report it is stated that two patients were under 20, and five over forty. In all the reports; however, it will be noted that the greatest incidence was in women between the ages of 23 and 35.

In this series, 17 patients, or 9.5 per cent gave a history of entire sterility, as compared with 21 per cent at Hopkins and 15 per cent at the Woman's Hospital, while the Cook County report states that nearly 14 per cent of their patients were sterile for a period of five years before the ectopic pregnancy. Of the 169 Charity patients who had been pregnant before, 11 or 5.9 per cent had had only miscar-

TABLE II

AGE	PATIENTS	AGE	PATIENTS	AGE	PATIENTS
17	3	28	11	39	3
18	1	29	17	40	3
19	5	30	10	41	1
20	9	31	5	42	2
21	4	32	10	43	—
22	6	33	8	44	—
23	14	34	5	45	—
24	14	35	9	46	—
25	10	36	2	47	1
26	11	37	5	48	1
27	8	38	4		

riages, as compared with 5 per cent at Hopkins and 17 per cent at the Woman's Hospital, while the Cook County report does not state how many patients had had miscarriages only.

The interval between the last pregnancy and admission into the hospital for ectopic was noted in 98 cases, the shortest interval being two months and the longest 29 years. At Hopkins the shortest interval was three months and the longest 19 years; at the Woman's Hospital the shortest interval was 12 weeks, and the longest 16 years; the Cook County report makes no note of this point. At the Charity the Interval between one and seven years in a series of 98 patients was 67.3 per cent; at Hopkins it was 74 per cent, the Woman's Hospital and the Cook County reports do not note this point.

In this series of 186 patients, only 11 gave a history of previous operation, or 5.9 per cent, as compared with 45 at Hopkins, or 14.85 per cent, and 19 at the Womans' Hospital, or 10.2 per cent. The Cook County report does not note this point. Sixteen of the 186 cases report treatment for a specific infection at some time before admission (three of the cases had positive Wassermanns on admission), or 8.6 per cent, as compared with an incidence of 10.8 per cent at the Woman's Hospital. The other reports do not note this point.

Owing to the difference in the method of statement, only the Hopkins report can be compared in detail as regards complaint on admission, and symptoms, but it is stated in all the reports that pain and bleeding are the most common causes why patients seek medical advice. At Charity 122 cases, or 66 per cent complained of pain, and 60, or 32 per cent of bleeding; at Hopkins, 84 per cent complained of pain and 31 per cent of bleeding; at the Woman's Hospital 96.6 per cent of the cases complained of pain alone, or pain with bleeding; while at the Cook County Hospital roughly 85 per cent of the cases complained of pain, and 64.2 per cent of bleeding, a higher ratio than was found in any of the other reports.

The length of time between the onset of attack and admission to the hospital is noted in 145 cases in the Charity records, but there

TABLE III

## COMPLAINT ON ADMISSION

COMPLAINT	NUMBER CHARITY	PER CENT CHARITY	PER CENT HOPKINS
Bleeding	60	32.2	31
Pain, all sites	122	66	84
General Abdominal	47	25.2	32.7
Lower Abdomen	37	19.9	22.8
Right Quadrant	9	4.8	10.9
Left Quadrant	5	2.7	10.9
Back	2	1.1	6.9
Bearing down and cramplike	22	11.8	2.6
Tumor in Abdomen	9	4.8	7.2
Swelling of Abdomen	1	.5	1
Tenderness	—	—	1.3
Suspected Pregnancy	4	2.2	.7
Miscarriage	20	10.8	.3
Menstrual Disturbance	1	.5	1
Nausea and vomiting	14	7.5	4.6
Fainting	1	.5	.3
Urinary Disturbance	—	—	1
Bowel Disturbance	—	—	.7
Missed Periods	20	10.8	34

## SYMPTOMS

SYMPTOMS	NUMBER CHARITY	PER CENT CHARITY	PER CENT HOPKINS
Acute onset, no bleeding	21	11.2	48
Acute onset with bleeding	62	33	24
Gradual onset	18	9.7	28
Irregular bleeding	51	27	76
Nausea and vomiting	43	23	45
Mass	7	3.8	15
Fainting	7	3.8	13
Fever	28	15.1	10
Chills	7	3.8	4
Continuous bleeding	13	7	—
Weakness	1	.5	29
Urinary disturbances	5	2.7	13
Pregnancy	3	1.7	3.6
Abortion history	14	7.5	.3
Membranes from uterus	5	2.7	.7
General pain	7	3.8	7
Pain in lower abdomen	57	30.6	9
Right quadrant	19	10.2	13
Left quadrant	11	5.9	14
Abdomen and epigastrium	1	.5	.7
Abdomen and umbilical region	3	1.6	.3
Bladder	1	.5	.3
Rectum	1	.5	.7
Lower extremities	3	1.6	1.7
Chest	—	—	.3
Upper abdomen	6	3.2	—
Back	8	4.3	6.3
Breasts	2	1.1	—
History of shock	27	14.5	4.9



is no statement on this point in the other reports. Several of the patients reported symptoms extending over a period of years, with exacerbation before admission, and the Hopkins report makes note of this fact also.

TABLE IV

TIME	PATIENTS	TIME	PATIENTS
Days		Months	
1	8	1½	11
2	3	2	27
3	4	3	10
4	1	4	1
5	1	5	1
6	3	6	—
Weeks			
1	7		
2	18		
3	19		
4	31		

In the Charity records, 78 patients, or 41.9 per cent, stated definitely that they had missed one or more periods, as compared with 34 per cent at Hopkins, 34 per cent at the Woman's Hospital, and 32.1 per cent at Cook County. Forty-one patients, or 22.5 per cent gave a history of irregular periods, and 51, or 27.4 per cent noticed that the periods were scant. At Hopkins 52, or 17 per cent noticed abnormalities. Sixteen patients, or 8.6 per cent gave a definite history of having regular periods at all times, compared with 6 per cent at Hopkins, although at Cook County 56 per cent neither missed their periods nor noticed any abnormalities.

TABLE V

PERIODS OVERDUE	PATIENTS	PERIODS OVERDUE	PATIENTS
Days		Months	
10	1	3	6
14	5	4	4
21	12	5	—
Months		6	3
1	15	7	—
1½	10	8	—
2	21	9	1

In the physical examinations reported in all of these studies, the majority of cases do not represent the ordinary presumptive signs of intrauterine pregnancy, and Wynne points out that most cases of tubal pregnancy show no very definite gross changes in the cervix and uterine body unless the fetus is living. The majority of the cases present physical signs denoting many of the other pelvic lesions.

TABLE VI

SIGNS	PATIENTS CHARITY	PER CENT CHARITY	PER CENT HOPKINS	PER CENT WOMAN'S	PER CENT COOK CO.
History of Shock	27	14.5	4.9		
Abdomen:					
Distention	8	4.3	30		14.2
Free Fluid	—	—	10		
Tenderness, general	21	11.2	7	5	11.3
Tenderness, lower abdomen	13	6.9	23	30	27.4
Tenderness, right quadrant	11	5.9	17	32	26.2
Tenderness, left quadrant	6	3.2	13	29	17.8

TABLE VII

	PATIENTS CHARITY	PER CENT CHARITY	PER CENT HOPKINS	PER CENT WOMAN'S	PER CENT COOK CO.
Rigidity	30	16.1	17		10.7
Mass	48	25.8	24		15.4
Pelvis:					
Vaginal Cyanosis	—	—	2	4	
Bloody Vaginal Discharge	11	5.9	25		
Softened Cervix	25	13.4	25	12	
Enlarged Cervix	8	4.3	16		
Softened Fundus	2	1.7	5		
Enlarged Fundus	25	13.4	25	32	27.4
Mass, Boggy	22	11.8	24	42	26.8
				not described.....	
Mass, Firm	1	.5	12		
Blood Clots	—	—	7		17.8
Crepitus	—	—			
Tenderness	8	4.3	48		
Mass to Right	44	23.7	—		49.4
					not located
Mass to Left	32	17.7	—		
Mass Behind	20	10.7	—		

Unfortunately, but fifteen of the cases showed a hemoglobin count before operation, and only forty-three showed a leucocyte count.

TABLE VIII

HEMOGLOBIN	NUMBER PATIENTS	HEMOGLOBIN	NUMBER PATIENTS
30-40	4	60-70	2
40-50	1	70-80	5
50-60	1	80-90	2

The highest percentage, therefore, 33 $\frac{1}{3}$ , showed a hemoglobin between 70 and 80; at Hopkins, in a series of 106 hemoglobin determinations the highest percentage, 18.7, was between 70 and 80; at the Woman's Hospital in a series of 100, the highest percentage, 26, was between 80 and 90. There is no hemoglobin record given in the Cook County study, and both Wynne and Farrar point out that a hemoglobin determination in a diagnosis of ectopic is of doubtful value, since there is no marked drop until 48 to 72 hours later, or after the ectopic is of considerable duration.

TABLE IX

WHITE BLOOD CELLS	PATIENTS	WHITE BLOOD CELLS	PATIENTS
5,000-8,000	10	15,000-20,000	2
8,000-10,000	9	20,000-25,000	2
10,000-12,000	8	25,000-35,000	2
12,000-15,000	10		

Thirty-nine of these cases, or 90.7 per cent, in a series of 43, showed a leucocytosis under 20,000; this compares with 90.5 per cent in a series of 82 at Hopkins, and 97 per cent in a series of 100 at the Woman's Hospital. The leucocytosis is so stated in the Cook County report that a fair comparison cannot be made.

The red blood count is not noted in the other reports, but was made in 12 cases at Charity.

TABLE X

RED BLOOD CELLS	NUMBER PATIENTS	RED BLOOD CELLS	NUMBER PATIENTS
1-1½ million	2	2½-3 million	3
1½-2 million	2	3½-4 million	2
2-2½ million			

The Charity records show that the temperature on admission in a series of 186 cases registered under 101 in 167, or 89.9 per cent, while the pulse on admission in a series of 174 cases was under 130 in 150, or 86.2 per cent; in three cases the pulse was so rapid it could not be counted, and in one case it was imperceptible. At Hopkins the temperature was under 101° in 91 of a series of 180, and the pulse was less than 130 in 91 per cent of the same series. At the Woman's Hospital in a series of 100, the temperature was under 101 in 97 per cent, and the pulse under 130 in the same per cent. At Cook County 94.8 per cent of the entire series had a temperature under 101°, and the pulse is not noted.

TABLE XI

TEMPERATURE	PATIENTS	TEMPERATURE	PATIENTS
95.5	2	99-100	79
96	2	100-101	19
96-98.5	32	101-102	13
98.5-99	28	102-103	3
99-100	5	103-104	1
		104-105	2

TABLE XII

PULSE	PATIENTS	PULSE	PATIENTS
60-70	1	110-120	32
70-80	24	120-130	9
80-90	42	130-140	8
90-100	36	140-150	2
100-110	16		

The preoperative diagnosis is recorded in only 84 cases at Charity, or 45.2 per cent. Thirty-three cases were correctly diagnosed, 3 were diagnosed with a strong possibility of ectopic, and 2 were diagnosed unruptured ectopic, making a correct diagnosis of 44 per cent. This compares with 46 per cent correctly diagnosed at Hopkins, 55.6 per cent at the Woman's Hospital, and 59 per cent at Cook County. The table of diagnoses follows:

Ruptured extrauterine .....	33
Probable extrauterine .....	3
Unruptured extrauterine .....	2
Chronic .....	5
Acute .....	6
Appendicitis .....	4
Ovarian cyst .....	1
Uterine fibroid .....	7
Pelvic abscess .....	4
• Tubo-ovarian abscess .....	10
Abortion .....	1
Incomplete abortion .....	3
Cancer of the cervix .....	1
Pregnancy .....	4

At Charity, the operation was vaginal only in 11 cases, or 5.9 per cent, as compared with 8 per cent at Hopkins, 7 per cent at the Woman's Hospital, while the Cook County report, which treats merely of diagnosis, gives no definite figures. The table of operations follows:

Vaginal only .....	11
Pelvic puncture and drainage .....	6
Vaginal, no description .....	5
Vaginal puncture and laparotomy .....	10
Dilatation and curettage with laparotomy.....	20
Laparotomy .....	171
Unilateral salpingectomy .....	53
Unilateral salpingo-oophorectomy .....	59
Bilateral salpingectomy .....	9
Bilateral salpingectomy, unilateral oophorectomy.....	14
Bilateral salpingo-oophorectomy .....	27
Ligation of tube .....	1
Suturing of tube .....	1
Hysterectomy, supravaginal .....	14
Hysterectomy, complete .....	9
Hysterectomy, not described .....	1
Amputation of cervix .....	1
Resection of uterus .....	1
Suspension of uterus .....	15
Myomectomy .....	1
Excision, cyst broad ligament .....	1
Puncture ovarian cyst .....	2
Appendectomy .....	56
Enterorrhaphy .....	2
Inguinal herniotomy .....	1
Laparotomy not described .....	8
Additional .....	8
Perineorrhaphy .....	5
Trachelorrhaphy .....	3

In the majority of cases, the peritoneal cavity was cleaned of blood and clot. Abdominal drainage was employed in 26 cases, usually in the form of a cigarette drain, and vaginal drainage through the culdesac in 12 cases, exclusive, of course, of the purely vaginal operations. In accordance with the more modern ideas, drainage is not now usually employed unless there is a specific need, such as infection or persistent oozing. In two cases where enterorrhaphy was necessary, owing to the serious bowel involvement, a Pezzer catheter was inserted. In three cases saline irrigation of the peritoneal cavity was employed, but this habit has long since been discontinued.

In 58 cases other conditions were found at operation and definitely noted:

Acute appendicitis .....	3
Uterine fibroids .....	5
Posterior displacement .....	17
Old tears .....	8
Direct inguinal hernia .....	1
Broad ligament cyst .....	1
Hydrosalpinx .....	1
Pyosalpinx .....	6
Ovarian abscess .....	2
Cystic oophoritis .....	8
Pelvic abscess .....	3
Tubercular abscess .....	1
Secondary intestinal obstruction .....	2

It is the policy of the Charity to operate on all cases of ectopic as soon as a definite diagnosis is made. Patients who enter in a serious condition are operated immediately as emergencies, otherwise the case is sent to the ward for observation. In many cases, because the patient gives an unsatisfactory history and the physical signs are not clearcut, operation is deferred. At Johns Hopkins, where the majority of patients enter following examination in the Out-Patient Department, the policy is to operate the day following admission, but this is only possible in a hospital where the patient enters with a diagnosis already made. At the Charity Hospital 112 patients, or 60.2 per cent were operated before the fifth day. At the Women's Hospital 81.4 per cent were operated before the fourth day.

The 182 operations were performed by 40 different persons. The highest number was 15 operations, performed by two men each, and the lowest 1, performed by 14 men each. At Hopkins 1 operator performed 44, and 4 performed 1; at the Woman's Hospital 1 operator performed 63, and 14 operators performed 1 each.

The location of the pregnancy was stated in 139 cases, 80 or 57.5 per cent in the right tube, and 58, or 41.8 per cent in the left. There was one case of bilateral pregnancy. At Hopkins, 50 per cent of the cases were in the right tube and approximately 49 per cent in the left,

TABLE XIII

TIME OF OPERATION	PATIENTS	TIME OF OPERATION	PATIENTS
Immediate	17	Fifteenth day	4
First day	17	Sixteenth day	1
Second day	23	Seventeenth day	1
Third day	16	Eighteenth day	2
Fourth day	16	Nineteenth day	1
Fifth day	13	Twentieth day	6
Sixth day	9	Twenty-first day	3
Seventh day	8	Twenty-second day	2
Eighth day	7	Twenty-third day	5
Ninth day	7	Twenty-fourth day	1
Tenth day	3	Twenty-fifth day	—
Eleventh day	6	Twenty-fifth—Thirtieth day	1
Twelfth day	7	Thirtieth—Fortieth day	1
Thirteenth day	2	Fortieth—Fiftieth day	2
Fourteenth day	3		

there being two cases each of right interstitial and right ovarian pregnancy. At the Woman's Hospital in the cases noted 51.4 per cent were on the right side, and 48.6 per cent on the left, with one case of bilateral pregnancy included in the percentage. The location is not stated in the Cook County report.

Unfortunately, the results of gestation are stated in only 126 cases: Rupture, 95; no rupture, 10; tubal abortion, 6; full term child, dead, 14; full term child, living at birth, 1.

These notes are so obviously incomplete that no comparison is attempted with similar statistics in other reports.

The pathologic report is positive in 52 cases, and negative in 6, though even where the report was negative, the operator was still sure, after operation, that he was dealing with an early ectopic. In 27 cases, 4 of which are included in the report, the fetus could be positively identified, and ranged from an embryo of a few weeks, to 14 full term feti, and one living child, who died within a few hours after delivery. Thus a total of 75 confirmations was secured, out of a possible 81. The pathologic reports for the other hospitals are not available.

In this series of 186 cases there were 23 deaths, or 12.3 per cent, which is unusually high as compared with 4.3 per cent at Hopkins, not quite 1 per cent at the Woman's Hospital, and 8 per cent at the Cook County Hospital. As is to be expected, the highest death rate prevails at the two general hospitals, where the patients are of a lower social status, where it is more difficult to secure adequate histories to justify very early interference, in cases that could be saved. and where a greater number of patients are admitted moribund. Of the 23 cases that died at Charity, two (8.9 per cent) were admitted in such a desperate condition that operation could not even be considered, and four others, 17.3 per cent, though operated, were admit-

tedly moribund on admission, and the prognosis was hopeless from the start. Of the 23 deaths, 22 occurred in ruptured cases. The causes of death follow:

Pulmonary embolus, 5 days after operation; Hemorrhage and shock, 11 hours after operation; Septic peritonitis, 6 days after operation (bowel involved); Hemorrhage and shock, 9 days after operation; Peritonitis, 4 days after operation; Peritonitis, 2 hours after operation (admitted moribund); Pyosalpinx and ovarian Abscess, probable peritonitis, 2 days after operation; Acute nephritis, peritonitis, 8 days after operation; Peritonitis, gangrenous placenta, colon-B. infection, two days after operation; Toxemia and localized peritonitis, 12 hours after operation (admitted moribund); Hemorrhage and shock, 24 hours after operation; Sepsis, no operation. Admitted moribund (partial autopsy); Shock and toxic hyperthyroidism, 4 days after operation; Peritonitis, no operation (admitted moribund); Acute salpingitis, 3 days after operation; Septicemia, 20 days after operation; Toxic ileus, 3 days after operation; Shock, 4 hours after operation (admitted moribund); Shock, 6 hours after operation (admitted moribund); Secondary hemorrhage, 12 hours after operation; Septic peritonitis, 6 days after operation; Shock, 8 hours after operation; Shock, 2 hours after operation.

#### CONCLUSIONS

1. The middle decade of the twenty-fifth to thirty-fifth year period of productivity in woman seems to be the most favorable for ectopic gestation.

2. It is stated in all reports that pain and bleeding are the most common causes why patients seek medical advice.

3. Pain, with or without bleeding, is present in every case of ectopic gestation, unless unruptured.

4. Unusual one-sided pelvic pain, when associated with evidences of peritoneal irritation, fainting, irregular bleeding, indefinite history of miscarriage, and palpable one-sided mass, warrants the diagnosis of ectopic gestation.

5. The treatment should be operative in every case, as soon as the diagnosis is made and the conditions for rapid and aseptic laparotomy are available.

## TUBAL PATENCY TEST AND UNSEALING BY SIMPLE AIR-FILLED PIPETTE\*

BY ROBERT L. DICKINSON, M.D., NEW YORK CITY

THE five methods of injecting the fallopian tubes for testing the passage or for distending or deploying them, have been, in order of time: (1) Injection of tincture of iodine, by Bovée and Stone. (2) Injections of semen into the tubes themselves, by Dickinson. (3) Insufflation of oxygen or nitrous oxide, by Rubin. (4) Injection of saline, by Cary. (5) Insufflation of simple air by the curved, blunt uterine pipette.

The Rubin method, as test or treatment, has had and will have, a wide and immensely important use. It is the one important recent gynecological development. The only query is whether the paraphernalia are necessary. The fluoroscope has been considered unnecessary. The pain in the shoulder is evidence enough. Then that is deemed superfluous. If there be no leak in the apparatus, and the gas disappears, the tubes must be patent. Now we may do away with the gas cylinder, the tubings, the pressure gauge, the water meter, and the volume of inflation of the peritoneal cavity. All the outfit for testing, and, what is more important, for the treatment of agglutinated or gently sealed tubes, is a pipette and common air.

The cervical canal must be free from disease other than cysts. Else its secretions may be blown past the portal of Curtis into the peritoneal cavity. Herein semen and saline have a risk markedly greater than air and gas.

The Skene uterine tube, the glass bent to the curve of a uterine sound, must fit the internal os snugly. Its tip is blunt. Two sizes suffice. If one does much work in this line, two different curves may fit the straight or the anteflexed general uterine canal. A single tenaculum steadies the cervix.

A small mass of lubricant on the external os is the telltale of regurgitation.

As the rubber bulb on the pipette is compressed, the air either goes through or refuses to go. The finger learns to recognize the proper resistance, and the patient's feelings indicate the time to cease.

No pressure gauge is required. In training oneself one may couple up the Tyco blood-pressure apparatus with a glass T and see for himself that none of the smaller rubber bulbs—they run up to 4 c.c. or one

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\*Read at a joint meeting of the New York and Philadelphia Obstetrical Societies, March 14, 1922.



dram—can be made to exert more pressure than the 200 mm. of mercury usually called the upper limit. Anyway regurgitation alongside the tube comes about this point or the patient stops one from going further.

The uterine cavity, as Cary and I have tested it with saline and semen, holds not over 10 minims, or 6.5 c.c., as a rule. The statement by Guyon and Poirier that the capacity is 2 to 4 or 5 c.c. refers to the postmortem relaxed uterus and includes the cervical canal as well, and leaves out of account the space occupied by the injecting tube.

Automatic control on injection of semen or saline is had by using a bulb on the pipette not over 20 minims or (1.3 c.c.), and with air inflation by not using a bulb over 4 c.c. (say 60 minims). The compressibility of air is taken into account in this difference in capacity. The rubber on the glass seals itself on after a couple of days, or may be tied fast. No length of elastic tubing should intervene to lower pressure readings.

#### SUMMARY

The uterine pipette and bulb furnishes an apparatus sufficient to test tubal patency and expand closed tubes by the use of air, as a substitute for gas pneumoperitoneal methods.

13 EAST SIXTY-FIFTH STREET.

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### SOME MOOT POINTS IN THE DIAGNOSIS OF THE CAUSES AND IN THE TREATMENT OF STERILITY\*

By BARTON COOKE HIRST, M.D., PHILADELPHIA, PA.

IT IS the reader's intention not to dwell on facts perfectly well known, but to present for consideration and a helpful exchange of views certain moot points in the etiology, the diagnosis of the causes, and the treatment of sterility. Stenosis and ante flexion, the stigmata of infantilismus, fibromata and other mechanical obstacles to the junction of spermatozoon and ovum, retroversion of the uterus, salpingitis and occlusion of the tubes, ovaries imbedded in exudate, mucopurulent leucorrhea, endocervicitis, infection of the endometrium, hyperacidity of the vagina are all well understood.

But what do we think of a lack of genital sense as a cause of sterility?

You remember no doubt the story told by Witkowski of two Russian brothers whom he calls A. and B. Finding themselves without offspring after some years of married life they determined to visit a

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\*Read at a meeting of the New York and Philadelphia Obstetrical Societies, March 14, 1922.

watering place famous for the cure of sterility in women. Accordingly they set out in an old-fashioned traveling carriage and arriving one day at an Inn, A was much taken with the appearance of the landlady. After some preliminary skirmishing he persuades her to meet him in the traveling carriage after dark. But A's wife, having overheard the conversation, bribed the landlady to allow her to meet her husband. Meanwhile A repented of his contemplated infidelity but informed B of the opportunity that presented itself, of which B. determined to avail himself. Now A's wife persuaded B's wife to take her place in bed, so that as her husband on his way to the assignation glanced in his room he would think his wife occupied her accustomed place in his bed. This arrangement was carried out with the result that B. met A's wife in the traveling carriage and A. went to bed with B's wife and both women were impregnated that night.

Then I remember another case. I delivered a woman by craniotomy after a very prolonged and complicated labor. The patient conceived a horror of sexual relations after her harrowing experience but continued to live with her husband. After six years she had for the first time an orgasm and became pregnant from the coitus.

This explanation may account for the numerous cases noted of married couples who use means of prevention for a considerable time after marriage and then find that when they wish a child, conception does not occur, in spite of the fact that an examination reveals nothing abnormal. I think we all agree that contraceptive methods systematically employed for a considerable time diminish the activity of the genital sense, a fact ignored by the disciples of Mrs. Sanger and not known to the laity; I believe therefore that these methods should be included among the causes of a sterility no longer desired by the interested parties, and that our patients should be warned of this risk.

There is another reason perhaps for the sterility and then the unexpected fecundity of Witkowski's two Russian couples. It is possible that there is the same enmity between certain uterine secretions and spermatozoa that we find in inimical types of blood. I have long thought that this would account for many otherwise inexplicable childless unions.

Does transplantation of a race to another climate and environment influence fecundity? We have on this continent peculiar phenomena that suggest the query. There is the extraordinary fecundity of the French Canadians in contrast with the diminishing birth rate of the race in its original home. On the contrary, there is the steadily decreasing number of children in the families of the Anglo-Saxons long settled in the United States.

I believe that the first generation of Russian Jewesses born in this country has a much higher percentage of sterility than is found in

Russia and that the women who are not sterile are bearing fewer children than their mothers.

Could this explanation account for cases of which the following is an example: A woman and her husband, both of Anglo-Saxon origin, found their union sterile after some years. The woman consulted every specialist in Philadelphia and we all did our favorite procedure without success. Finally she was advised to go abroad with her husband and to spend a summer in England. She returned pregnant.

I wonder whether the experience of the other members of this joint meeting coincide with mine that obesity is one of the most frequent causes of sterility in women, ranking third perhaps after ante flexion with stenosis and salpingitis? I find that a system of weight reduction in fat women corrects the comparative amenorrhea and deficient ovulation in such patients and that then, with or without the other treatments for sterility a conception occurs which otherwise would have been improbable.

I am reminded of this fact by a recent experience. I was consulted 18 months ago by a woman on account of sterility. Pelvic examination was negative. She weighed 225 pounds. I gave her a printed set of directions for weight reduction. She returned this week weighing 185 pounds and pregnant.

In addition to the many well recognized causes of sterility and the few just mentioned in a speculative sort of way, there will always be inexplicable cases. Take, for example, one of my patients who lived with her husband for 24 years without conceiving and then found herself pregnant; both the long sterility and the eventual conception being unaccountable.

In the second section of this communication dealing with the diagnosis of the causes of sterility, to avoid discursiveness, it would seem wise to limit the discussion to two questions: the utility of examining spermatozoa deposited in the female genital canal at intervals after coitus and the tests for patency of the tubes. On both these points there is room for difference of opinion. It will be interesting and instructive to hear in what direction the majority of opinions incline. Abnormalities in morphology, vitality and motility of spermatozoa recovered from the female genital tract can only be due, as far as we know at present, to (1) the presence of these conditions when the semen is emitted; (2) hyperacidity of the vagina; (3) mucopurulent leucorrhea, endocervicitis or infected endometrium and (4) the possible enmity of normal uterine secretions to normal spermatozoa. For number 4 nothing can be done except a change of mates which is not usually practicable. Mucopurulent leucorrhea, or an infected endometrium, we all agree, must be remedied whenever found in sterile women; we all, I dare say, recommend alkaline douches be-

fore coitus, and the knee chest posture afterward in every case of sterility; and abnormalities in spermatogenesis are most easily detected by the examination of the freshly emitted semen. Therefore the routine examination of the female genital tract after coitus does not seem to me worth the inconvenience of such examinations to both physician and patient. Occasionally, however, this examination made as Huhner sensibly insists of spermatozoa in the endocervical and intrauterine secretions at any time 12 to 48 hours after coitus, will yield information of interest, even if it does not suggest any method of treatment. The same may be said, I think, of Reynold's meticulous examination of spermatozoa.

In regard to the tests for the patency of the tubes, we are all indebted to Dr. Rubin, Dr. Reuben Peterson and others for perfecting methods and implements to inject nitrogen, oxygen or carbon dioxide gas into the uterus and to demonstrate its passage into the peritoneal cavity through the tubes by pressure observations or by the x-ray or by both. I have used and am using this method by Dr. Rubin's very ingenious and convenient apparatus and have also employed the simpler, less expensive method of Dr. Carey: but these injection tests reveal only one of the intrapelvic anomalies that prevent conception: and they are not, I think, entirely devoid of risk. Two patients have lost their lives in Philadelphia in the last few months in the two hospitals with which I am connected, from the transperitoneal injection of gas and it would be impossible, I think, always to be sure that the uterine cavity and tubal canals are sterile so that an occasional peritonitis might easily be the consequence of this test; and be it remembered it is in cases with a history of previous pelvic infection that we most often desire to test the patency of the tubes. Nevertheless these tests are a valuable addition to our methods of precision in diagnosis and they have attained and will maintain an unassailable place among our diagnostic resources.

But I confess I prefer the exploratory section. It is safe; it reveals all the possible intrapelvic obstacles to conception and allows of their immediate correction.

The last problem before us is the treatment of sterility. Of the many methods that might be employed I should like the privilege of briefly introducing three for discussion: (1) the best and safest means to secure a permanent dilatation of the cervical canal; (2) the electrical stimulation of illdeveloped pelvic organs; (3) the dangers of artificial insemination and the medicolegal status of physician and offspring in extraconjugal insemination.

(1) The uterine stem pessary to correct anteflexion was familiar to the profession when I first entered it but its use was soon discontinued. The idea was revived again in the various models of uterine

drains such as Gill Wylie's and others. I employed these implements for about two years, but had some unfortunate cases of salpingitis as a result which made me doubtful of the propriety of their use. After two or three such experiences I happened to read in a British medical journal a recommendation of Schatz's *metranoimeter*. I imported the implement, modified it and have used it since 1908 or 1909. In one series of 150 cases collected from my records by Dr. P. F. Williams before 1913, he found a cure of sterility in the number of replies to inquiries sent out of 40.6 per cent. I have recently sent 270 letters to the patients in one hospital service operated on since 1913. Replies have been received from 22 per cent (60) and of this number 38.3 per cent (23) have borne children, and there have been no infections of the tubes. In other words, of 420 cases dilated for stenosis and antelexion as a cause of sterility it was possible to trace 113 over a period of some years. Of this number 39.4 conceived after a sterile marriage of more than 18 months to 18 years.

Now is the continued use of intrauterine drains retained for a considerable time justifiable in view of the 7 per cent of infections reported from the Woman's Hospital of New York and the admitted 4 per cent of infections by the advocates of this method at a meeting of the Philadelphia Obstetrical Society? I think not. Quite as good if not better results may be obtained by a method free from risk.

(2) I am surprised to find that electrical stimulation of the infantile uterus seems to be neglected by many gynecologists. I have referred to a number of cures by this means at a recent meeting of the electrotherapeutic society. Although aware that a single case counts for very little, I believe I am justified in mentioning a recent experience: Six years ago I dilated the cervical canal for stenosis. The uterus was ill-developed, so I referred her to the chief of dispensary on my service in the Howard Hospital, Dr. Mann. For two months out of every year this woman took a course of electrical treatment and is now pregnant for the first time. It will be interesting to hear the opinion and the experience of the members on this point.

Finally artificial insemination, demonstrated to be a practicable treatment of sterility with a certain percentage of successes, must be more carefully considered. While it may be successful, the injection of seminal fluid into the uterus is not entirely safe. I have recently operated on a particularly virulent and extensive pelvic suppurative infection the result of artificial insemination.

And then there are interesting medico-legal questions involved in extra-conjugal insemination. For example: I know of two cases recently in Philadelphia in which the seminal fluid of men other than the husband was employed with success.

A childless couple in a town in Ohio, hearing of the success of a cer-

tain woman physician in Philadelphia with artificial insemination, determined to consult her but found that the railroad fare for two was more expensive than they were willing to afford so the husband suggested that one fare could be saved by utilizing the services of his brother who lived in Philadelphia. This was done and the woman returned pregnant.

In another case an impotent man utilized a male relative with success.

Such cases, presenting a new medicolegal problem, demand some agreement with our legal brethren as to the legitimacy of the offspring, their right to the inheritance of property, and the responsibility of the physician in effecting what in reality is an illegitimate impregnation.

1821 SPRUCE STREET.

(For discussion, see p. 190.)

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## UNSUSPECTED MALE STERILITY\*

BY W. H. MACKINNEY, M.D., PHILADELPHIA, PA.

AFTER analyzing a number of cases of sterility, due to anatomic defects or impotence from various causes, I decided that I would confine my remarks to a group of cases constituting what might be termed unsuspected male sterility. It has been my privilege to examine completely 82 married males, the wives of whom had consulted Dr. Barton Cooke Hirst, seeking a reason for their failure to conceive. Many of these women had been operated upon with the idea of facilitating conception. In all cases, as may be inferred, the sexual act was consummated to the apparent satisfaction of husband and wife. These 82 males were carefully studied with regard to their past medical history, occupation and general habits. A physical examination of the genital organs, including a chemical and microscopic examination of the urine and microscopic examinations of the fluid expressed from the prostate and seminal vesicles by massage *per rectum* was made. The semen collected in a condom and maintained, as near as possible, at body temperature, was examined within three hours after ejaculation. Where the first examination of semen showed defects in number, form or motility of spermatozoa, a reexamination of the semen was advised, and in many cases, three or more examinations were made before an opinion relative to virility was given.

Of 82 cases examined, the male was found virile in 43 cases, or 52.4 per cent. In 39, or 47.6 per cent, serious defects ranging from complete azoospermia to definite degrees of oligospermia with

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\*Read at a meeting of the New York and Philadelphia Obstetrical Societies, March 14, 1922.

alterations in structure and impaired activity of spermatozoa, were determined and assigned as causes of the sterile marriage.

Of the 39 males considered sterile, 22 showed a complete azoospermia, that is, a total absence of spermatozoa, and 17 showed an oligospermia, that is, a very appreciable and constant diminution in the number of spermatozoa.

In the cases of complete azoospermia, an obstruction to the epididymi, vas deferens or ejaculatory ducts, was suspected, in 7 cases which presented a very definite history of urethritis, complicated with unilateral or bilateral epididymitis and confirmed by the finding of definite inflammatory indurations in the epididymi. The remaining 15 cases of azoospermia were obviously due to defective spermatogenesis, and for the most part, presented no history of inflammatory conditions of the urethra or adnexa—and upon physical examination showed various conditions of the testicles, ranging from the apparently normal to the obviously atrophic and worthless organ, from the standpoint of spermatogenesis.

In considering the subject of azoospermia, one is at once impressed with the fact that cases, the result of obvious obstruction to the passage of spermatozoa from the testicles to the urethra, constitute only about one-third of the total number of such cases and the belief that an antecedent gonorrhea with complications, chiefly epididymitis, is the chief cause of azoospermia, fails of confirmation in this series of cases. Gonorrhea and its complications are the main etiologic factors in the cause of obstructive azoospermia, but the cases of azoospermia due to other congenital or acquired conditions of the testicles, affecting the spermatogenic properties of the seminiferous tubules, outnumber the former two to one. In trying to determine the cause of azoospermia due to defective spermatogenesis, a careful analysis of the history of previous diseases, operations, and accidents was made, supplemented by physical examination of the testicle, vas, seminal vesicles and prostate.

Twelve of the 15 cases denied gonorrhea and the remaining 3 who acknowledged a previous gonorrhea, presented no history of complications nor evidence of remote effects of gonorrhea which might be construed as a possible etiologic factor in their condition. Ten cases presented no history of any of the commonly regarded serious infections, such as typhoid fever, pneumonia, malaria. One case gave a definite history of testicular mumps, five years prior to marriage. In 7 cases physical examination revealed no abnormality in size, shape, or consistency of the testicle. In the remaining 8 cases—obvious defects in size, shape and consistency were noted, varying from moderate reduction in average size to advanced atrophy of one or both testicles. In but one case, namely that of bilateral orchitis, due to mumps, could a definite, well recognized etiologic factor in testicular atrophy be

ascribed. In the remaining cases, nothing in the history could be construed as a possible cause of the failure of spermatogenesis, except a congenital defect.

The cases of oligospermia, or those in which spermatozoa are present, but in comparatively small numbers, comprise a large and interesting group of cases. Oligospermia simply means a reduction in the average number of spermatozoa contained in the ejaculate, and as it is impossible to estimate the normal or average number of spermatozoa in the normal ejaculate, one must be guided in his opinion by personal experience and numerous examinations, in deciding that an oligospermia exists. Fortunately the diminution in the number is so obvious in the large majority of cases, that simply a glance at a number of microscopic fields convinces one, that the number of spermatozoa are diminished. There are, however, relative grades of reduction which may be classified as mild, moderate or marked, and it naturally follows that the fewer the number of spermatozoa, the less the probability of fecundation, so that none of these cases can be said to be absolutely sterile. Considerable care must be exercised in giving an opinion, stating to the patient that fecundation is possible but highly improbable. The opinion will also vary depending upon the degree of reduction and probably more upon the conformity to normal of those present in size, shape and motility. It is this group of cases which particularly demand repeated examinations of the seminal fluid, and advice as to frequency of coitus, before an opinion is given. In this group of cases, I find, 17 patients married from 18 months to 11 years and as yet unblessed with offspring. One patient married two years had a child by a first wife, he however, contracted gonorrhea after the death of his first wife and six years before the second marriage, and the semen obtained for examination, showed only four or five dead spermatozoa to microscopic field.

In reviewing the past medical history of these cases, 10 disclaimed any serious illness and denied venereal infection, 2 had been operated for double inguinal hernia, 1 only acknowledged a gonorrheal infection. One had had a severe attack of typhoid fever. One had been operated for a pus appendix, one for gall bladder disease and one had had malaria.

Physical examination revealed the testicles apparently normal in 13 cases, in but 4 cases was the testicle undersized, soft or flabby. In 2 cases the epididymus on one side was slightly infiltrated. Chronic inflammation of the prostate as manifested by alterations in the size, shape, consistency and sensitiveness of the prostate, and the presence of pus in the expressed secretion, was present in five cases.

A study of the number, morphology, and motility of the spermatozoa, was interesting. In some cases, nothing appeared abnormal except



that very few spermatozoa existed. The head, midpiece and tail were perfectly developed and motility existed. In the majority, however, the existing spermatozoa were deformed, the head globular or flattened, the tail incomplete and motility very slight or absent.

No case of true necrostermia, that is, an average number of spermatozoa all of which showed no motility, were encountered in this series. I might be pardoned a moment, to discuss and call your attention to this very interesting group of necrostermia. They are uncommon but undoubtedly exist, and contribute strong evidence that motility is imparted to the spermatozoa by a substance apart from that generated by the true spermatogenic epithelium of the seminiferous tubules.

Attention has been called by several authors, to the intimate relation of the hormones of various ductless glands and of portions of mixed glands, as the testicle to sexual development, sexual activity, and to the motility of spermatozoa. There is no doubt in my mind, that such glands as the anterior lobe of pituitary, portions of the adrenals, thyroids and interstitial cellular matter of the testicle, play a very important rôle in cases of this type.

In considering the cause of oligospermia, one is face to face with a very complex problem. The term oligospermia, is only a relative one and simply means a diminution in the number of spermatozoa below the average or normal amount found in the ejaculate. It is also possible and seems likely, that this condition in the same individual might vary within wide limits, at different times, depending upon numerous factors—such as diet, mental and physical activity and sexual activity.

Reynolds and McCombes have considered diet as a very important factor in both sexes and have noted the effect of restricting the fat, protein, and calcium contents of the diet in white rats, in diminishing fertility. They report cases of oligospermia considerably improved by regulating the fat, protein and calcium content of the diet to the physical requirements of the individual.

Intense mental activity, or physical exhaustion or debility, too frequent intercourse, the x-ray and probably numerous other factors, such as excessive use of alcohol, tobacco, etc., may exert in certain instances, an inhibitory influence upon the formation of spermatozoa, with a resulting oligospermia, and these factors must be taken into account as a possible cause of oligospermia and considered in the proposed treatment of the condition.

It is not my intention to discuss the treatment of male sterility. It is, on the whole, highly unsatisfactory. In certain types of obstructive azoospermia, operations to remove the obstruction are to be recommended. In failure of proper spermatogenesis, all possible con-

tributing factors must be taken into consideration in an effort to increase the spermatogenic function.

In concluding, I may briefly summarize the salient points in a consideration of sterility:

1. In all cases of sterility the condition of the male should be investigated.

2. This investigation consists essentially in determining the quantity and quality of spermatozoa present in the ejaculate.

3. Various statistics estimate the male to be responsible for sterility in marriage in 40 to 50 per cent of cases.

4. The treatment of male sterility is, on the whole, unsatisfactory. In cases definitely due to obstruction, operations of various types are recommended, and are successful in a small percentage of cases. In defective spermatogenesis many treatments are advised but success is entirely problematic.

1703 CHESTNUT STREET.

(For discussion, see p. 190.)

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## A REVIEW OF SEVENTY-FIVE CONSECUTIVE HYSTERECTOMIES FOR FIBROMYOMATA UTERI\*

BY ROYAL C. VAN ETEN, M.D., F.A.C.S., NEW YORK, N. Y.

THIS is a review of seventy-five hysterectomies from the records of the Sloane Hospital for Women, over the period from July, 1919, to June, 1921. The cases include both private and ward patients and represent the work of seven operators. More recent cases have purposely been omitted, in order to afford a working basis for the "follow-up."

The "Sloane" management of cases is somewhat different and, perhaps, somewhat more careful than the usual treatment. It is to this, in large measure, that we attribute our good results. Each case has been studied carefully, some of them for six months. All have had urinalysis, complete blood counts, (in some cases blood grouping), Wassermann tests, cervical and urethral smears and blood pressure observations. Blood chemistry has proved of little value. Practically all cases have been examined by a competent medical man as to the advisability of operating, as to possible complications, and as to contraindications. In almost every case there has been a direct personal consultation with all the staff and attending surgeons. All have had pathological examinations of specimens removed. We have not tried digitalization of cases previous to operation, as has been done at the Mt. Sinai Hospital.

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\*Read at a meeting of the Section on Obstetrics and Gynecology, New York Academy of Medicine, March 28, 1922.

While there is a general impression of good results obtained, to ascertain definite information would, of course, require a prolonged, careful and accurate "follow-up." Only six months have elapsed since our last reported case. This paper can give only the findings to date and try to formulate conclusions which may be drawn regarding: 1. General morbidity, 2. The end result, as regards anemia, general improvement, changes in the circulatory system, etc., following the extirpation of fibroid masses in the pelvis, and 3. A comparison of these results with the results obtained by radium in similar cases. This is a considerable undertaking and covers a large field. Let me simplify as much as possible.

In the seventy-five cases there were:

1. 20 complete hysterectomies ("in toto")
2. 55 supravaginal hysterectomies
  - a. 15 without removal of adnexa
  - b. 16 with one ovary and tube removed
  - c. 44 with both ovaries and tubes removed
  - d. 40 with removal of appendix

Additional treatment was given for the following complications: Salpingitis 23, ovarian cysts 17, adhesions 18, chronic appendix 25.

The symptoms before operation were hemorrhage in 34, signs of growth in 11, signs of pressure in 26, pain in 35, and intestinal symptoms in 4, or any combination of these, there were some with all.

The operative recoveries were uncomplicated in 67, complicated in 8, chiefly slight hematoma of the broad ligaments, or slight pelvic induration. Follow-up reports were obtained on 70 cases.

The anatomic and symptomatic results were satisfactory in 70 and unsatisfactory in five. The disagreeable symptoms for the patient were continued pain, bladder irritability, adhesions, nervousness (menopause symptoms), constipation, postoperative bleeding (1), and one death, 2 months, 10 days postoperative, or a mortality of 1.3 per cent. The ages varied from 25 to 56 years, and there were 26 under 40 years. From this it will be seen that there were no cases of phlebitis, of postoperative pneumonia, or ascertainable embolus.

1. As regards general morbidity. The postoperative temperature in these cases was on an average 101°, to normal on the fourth day. Some ran none at all after the first day. The convalescence was satisfactory in all but the one patient who died.

2. As regards anemia. Careful blood counts (complete) were taken in all cases before and after operation. In 65 per cent anemia was clearly due to previous bleeding. In 15 per cent it seems reasonable to assume that it was due to toxic causes, as the fibroids on removal and section showed degeneration. The last 20 per cent must remain unclassified at present. In three cases, there was such a marked

anemia that transfusion was done before operation. We believe that a hemoglobin content of 45 per cent is a distinct contraindication to operation, except in extreme cases. Below 35 per cent, practically excludes a complete operation.

3. As regards blood pressure postoperative. In 50 cases the blood pressure was taken following as well as before operation. There was an average lowering of 5 to 10 mm. in the systolic pressure. None went up, all went down a little.

4. As regards circulatory improvement. Aside from local, i.e., pelvic and femoral circulation, we found not only the above blood pressure changes, but also an increased general circulatory improvement, characterized by more steady heart action, slowness of the pulse, and personal well-being. Dr. Studdiford had one case in particular whose recovery has been marvelous. A woman, single, 40 years old, had known of the existence of fibroids in her abdomen for years. Her doctor could not persuade her to have an operation. Finally, when orthopneic, dyspneic, and with much edema of her lower extremities, to say nothing of pressure symptoms in the abdomen, she had these large tumor masses removed with surprisingly good results. This shows what she might have been spared if an earlier operation had been done.

The use of radium and x-ray must be mentioned in relation to the treatment of fibroids. In Dr. Howard Kelly's review of 216 cases treated with radium in 1918 (*Surg., Gynec. and Obst.*, 1918, xxvii, 402), we see that many of our own are outside of his classifications, e.g., presence of pus tubes, cysts of the ovaries, and pressure symptoms. Cystic, eroded and lacerated cervixes also would have been unaffected by the use of radium. As contraindications Kelly gives no inflammatory conditions, no cysts of ovaries, no complications, e.g., appendicitis, gallstones, no pressure symptoms, no fibromata with malignant changes. And at a meeting of the New York County Medical Society, January 23, 1922, he stated that in a series of 700 cases, nine out of ten stopped bleeding with the use of radium.

It is difficult to tell if there are complications present, difficult to tell if there is a degeneration in the fibroid. Perhaps, insufflation and x-ray may help.

And now a word about our technic to which, in a measure, we attribute our good results. All cases are subjected to certain preparatory measures. Not the least of these is hospitalization for five to seven days before operation; contrary to the previous custom of "in at night, operation in the morning." The day before operation, the area is shaved, vaginal, abdominal or both. At seven P.M. three drams of milk of magnesia are given, also one soap-suds enema. On the morning of operation, no breakfast is taken. A urine specimen is sent to the laboratory, and one soap-suds enema is given. Nothing by

mouth after midnight. Before going to the operating room, the patient voids. On the way to the operating room, a chest protector, laparotomy stockings, and a cap are worn. Iodine preparation, both vaginally and abdominally, is used. This includes in practically all cases an injection of iodine into the cavity of the uterus. A final catheterization is done and thorough pelvic examination under ether is made. A preliminary curettage was done in 65 per cent of the cases. Radium was used in one case before, and in one after operation where carcinoma of the fundus was found coincident with the fibroma. We use great care in hemostasis, peritonealizing and in closing the wound. We rim out the cervix in addition to removing a wedge for better approximation, and for cleaning out the canal; doubtful cervixes, i.e., cystic, or with deep lacerations and erosions have been removed with the uterus. In the hemostasis, we have doubly ligated the uterines in each instance (a technic developed by Dr. Studdiford), including the cut uterine in the first cervical suture. Hemostasis has been complete in all cases, and little loss of blood has resulted. We peritonealize carefully to prevent infection and adhesions, just as we use iodine to prevent sepsis.

In 20 cases we did a complete hysterectomy, all of these had lacerated, or "dangerous-looking cervixes." The term "precancerous" is too sweeping for some of us to accept. The operation of complete hysterectomy is much more difficult and some of the after-effects are certainly more distressing to the patient in the case of failure.

Perhaps, certain typical notes on our cases may be interesting, e.g., "temperature rose to 101° after operation, running as high as 100° for six days postoperative, dropping gradually to normal. Convalescence otherwise uneventful without untoward symptoms." As a final note on discharge, "Abdominal incision firmly healed, very slight vaginal discharge; cervix looks and feels normal, high up; patient well but weak; going to country to convalesce."

Each patient is told what was done; what to expect in the way of symptoms; what not to do; and is given a follow-up card with the operative diagnosis and procedure on the back, if she goes to another hospital at any time. The follow-up for us is at six months, one year, or as often as the case demands. Quite a large number of our ward cases were sent to the country by our Social Service Department for convalescent care.

Let me give a typical follow-up note: Mrs. S. operation 6-3-21.—Note 10-23-21: "Bearing-down pains, for which patient originally came to the clinic, have disappeared. Occasional pain in back when she does heavy work; does general housework, so that she feels benefited by the operation. Abdominal scar well formed; external genitals negative; pelvic floor gives good support; cervix, no laceration, small, movable; no masses felt in lateral fornices; uterus not felt.

Just a word about one or two of our cases. Mrs. A. J., 42, colored, bleeding for six months; hemoglobin 35 per cent, found to have a Wassermann 4+; treated by the Department of Syphilology for two months with "606" and injections of mercury; bleeding stopped with "606." Transfused to bring her hemoglobin to 60 per cent. Operated upon six months after she first came under our observation. The follow-up three months later, found that although she was still having some antisyphilitic treatment, she was also bleeding from a small polyp which had formed in the cervix stump. This was removed and now she is entirely well. There was one case with the so-called chocolate cysts of the ovaries with fibroids—now after nine months doing splendidly and with a systolic blood pressure of 120 mm. of mercury, instead of 150 mm.

One death was due to an error of judgment on my part. A woman of 67, with a persistent sinus, from an old tubercular hip, operated upon by Dr. C. McBurney in 1893, and twice since by other operators, came to the Vanderbilt Clinic with a large mass in the abdomen, which I felt convinced was an ovarian cyst and which I hoped would shell out fairly easily. Even under ether, the mass seemed moderately movable, and although her cardiac action was not good, I felt that the removal of the cyst would greatly help the patient. Needless to say, I was dealing with adherent fibroids, and a most difficult operation was done in removing them. She lived for two months and ten days, but developed a fecal fistula and a terminal pneumonia carried her off.

#### SUMMARY

1. The morbidity rate in this series and the gradual improvement after operation has been most striking.

2. The anemia has been markedly improved.

3. We have found a definite fall in the blood pressure postoperative, in one instance from 170 to 130 mm. systolic.

4. Carefully prepared and carefully watched cases give the best final result.

5. Our statistics have shown that the follow-up is an absolute essential for success and knowledge of cases.

6. We have intentionally left out of this study all vaginal hysterectomies; all pregnancy cases complicated by fibroids; and all cases where myomectomies were done.

## OBSERVATIONS ON THE TREATMENT OF SYPHILIS IN PREGNANCY IN THE DEPARTMENT OF HEALTH IN DETROIT

BY WALTER E. WELZ, M.D., F.A.C.S., AND ALFRED E. VAN NEST, M.D.,  
DETROIT, MICHIGAN

IN 1915 J. Whitridge Williams reported syphilis as the causative factor in over 26 per cent of 705 fetal deaths occurring in 10,000 deliveries at the Johns Hopkins Hospital. It has been the experience of most obstetricians that the greatest causative factor of premature deliveries and macerated feti is syphilis. In an effort to reduce fetal mortality from this cause, an attempt has been made to lessen the incidence of inherited syphilis through prenatal care in Prenatal Station I of the Department of Health of Detroit. We aim therefore to diagnose syphilis as early as possible in pregnancy and to commence treatment at the earliest possible time, in order to cure the mother and child before birth.

After admission a brief family history of the patient is taken. At this time an effort is made to uncover any familial luetic conditions. A short personal history with special reference to luetic infection, lesions or antiluetic treatment is then secured. A concise history of labors is noted in chronological order. The year of each abortion, miscarriage and labor is written in order of occurrence; after the year of each delivery is written the period of pregnancy, duration of labor and character of delivery in order. Stillbirths are noted in order of occurrence as well as any pathology of pregnancy, labor, or puerperium of a given delivery. The patient is given a thorough physical examination at the first visit: Luetic changes as shown by dermal, vascular, neurological involvement are noted in all cases. Blood for a Wassermann test is always taken from every patient at the first visit. Those whose history is indicative of luetic infection, but whose Wassermann reaction returns negative or faintly positive, are given luetin and provocative Wassermann tests to aid in diagnosis. A Wassermann test is made on the spinal fluid in selected cases.

During the year 1921, 1467 new prenatal cases attended this clinic. There were 699 white women (47.6 per cent) and 768 colored (52.4 per cent). Of this number 193 (13.1 per cent) were diagnosed as syphilitic. Among the white patients 40 (5.7 per cent) were syphilitic. Among the colored patients 153 (19.3 per cent) were syphilitic. For various reasons 46 of the entire number were lost track of and 147 were cared for through pregnancy and the results of delivery noted.

Diagnosis was not made by a positive Wassermann reaction alone.

Of the 147 cases completed, 128 had a positive Wassermann reaction from their blood, an incidence of 87 per cent. The Wassermann test was usually considered positive in which there was a 2, 3, or 4+ reaction with alcoholic antigen.

Luetin was used as a diagnostic aid in 54 prenatal cases. These resulted in 42 positive pustular reactions and 12 negative, a percentage of 77.6 per cent positive. In the same series there were 45 positive Wassermann reactions with 9 negative, or a positive percentage of 83.3 per cent. As compared with the Wassermann reaction the luetin test agreed in 93.3 per cent of these cases.

Only one chancre was demonstrated in the entire number of cases. Twenty-nine (19.7 per cent) had luetic skin lesions. Forty-two (28.5 per cent) had absent or markedly retarded reflexes. Eighty-three (56.7 per cent) had ocular changes. Of these 18 (12.2 per cent) had definite Argyll-Robertson pupils. Seventy-four (50.3 per cent) had glandular involvement.

Abortions of feti under 16 weeks' development are considered of no diagnostic value, as transmission through the placenta probably requires a minimum of three months before development of syphilis in the fetus. Weber\* in 35 cases of abortion during this period was able to rule out lues in every case. Histories of previous miscarriages at from 16 to 28 weeks pregnancy, premature deliveries to 40 weeks' duration and delivery of macerated feti are considered valuable aids in diagnosis. In the Munich Woman's Clinic† from 252 luetic children 201 (82 per cent) were delivered prematurely. In our series there were 106 multiparous women. Of these 57 had given birth to 129 premature deliveries, previous to attendance at the clinic, an average of 2.2 per individual.

An effort was made to confirm diagnosis in those feti which were stillborn or died while at the Herman Kiefer Hospital, by means of postmortem examinations. Also a Wassermann test was made from the cord blood of all babies born in the Hospital. Living children of luetic or suspected cases were examined carefully for signs of the disease; also they were examined at the end of six weeks for luetic signs which might have developed in that time.

All possible factors which bear on the individual case were weighed to diagnose lues. Where there was a negative blood Wassermann other positive findings, physical, anamestic, luetin test or spinal fluid tests were considered of sufficient importance to base a positive diagnosis on.

As soon as a positive diagnosis of syphilis is made treatment is started regardless of the period of pregnancy. Two injections of salicylate of mercury in goose oil, and one intravenous injection of

\*Quoted by Döderlein, *Handbuch der Geburtshilfe*, vol. 2.

†Döderlein, *Handbuch der Geburtshilfe*, vol. 2.



neosalvarsan are given weekly for a period of six weeks. The first injection of neosalvarsan is gm. 0.3. Subsequent injections are gm. 0.45 for two injections, then gm. 0.6 per injection. If time permits a period of one month's rest is followed by a second course of the same treatment. In marked renal conditions the use of mercury is lessened or stopped. So far as possible the course of treatment is continued without any intermission. We find considerable difficulty in persuading some to continue treatments as they feel perfectly well without them, and not too well after mercury injections.

All babies from syphilitic mothers regardless of the result of cord Wassermann test are referred to an Infant Welfare Clinic for further observation and treatment. The record from the Prenatal Clinic is sent also for the babies' record there. All mothers are informed of the hidden danger of the disease and told that the other members of the family might be infected. They are then urged to have all other members of the family carefully examined for evidences of the disease. They are advised to continue treatment until the disease is eradicated. The importance of curing the entire family is clearly stated to them at the same time.

#### RESULTS

Of the 147 syphilitic mothers cared for by the clinic, 46 had adequate treatment consisting of three or more injections of neosalvarsan and eight or more injections of mercury.

These gave birth to 45 living children and one stillbirth, a fetal mortality rate of 2.1 per cent. The remaining 101 had insufficient or no treatment. These gave birth to 26 miscarriages or stillbirths with fetal development of from 16 to 40 weeks. This is a primary fetal mortality of 25.7 per cent for neglected cases.

In this series were eight miscarriages at from 16 to 28 weeks. All of these were not treated.

Of the 19 stillbirths occurring in the third period, 28 to 40 weeks, only one had full treatment and that was given in the third period of pregnancy.

Five mothers who had full treatment in the first period (up to 16 weeks' pregnancy) gave birth to living children with no sign of syphilis.

Nineteen mothers who had full treatment in the second period of pregnancy, 16-28 weeks, all gave birth to living babies.

It was possible to obtain cord Wassermanns only from those babies born at Kiefer Hospital. Among these, some of the tubes were broken and the blood of others was anticomplementary. There were only 79 specimens which could be properly examined;—63 of these (78.7 per cent) were positive.

Of the 79 cord Wassermanns examined 26 mothers had had full treatment. The result of the babies' Wassermann tests in these 26 cases was 8 (30 per cent) negative. From the 53 mothers who had no or insufficient treatment only 8 cord Wassermann tests were negative (15 per cent).

#### DISCUSSION

Approximately 85 per cent of the mothers diagnosed as syphilitic suffered from latent syphilis. None of these had any complaint of illness and visited the clinic only because they were pregnant. It was only because of routine examination that these were discovered.

It is of the utmost importance to make an early diagnosis so that early treatment can be instituted. As syphilis is only transmitted through the placenta to the fetus after a period of about three months, it is evident that the treatment instituted early in pregnancy is capable of preventing fetal transmission. After the spirochaete has been implanted in the fetus, the possibility of fetal cure is lessened, and more difficult to accomplish. It is questionable whether antisypilitic treatment through the mother can be of any value to the fetus *in utero* when the vital organs of the fetus are severely involved. So, as far as the fetus is concerned the later the treatment is begun in the mother, the less possibility of either cure or control on the part of the fetus. It is our opinion that full treatment should be attempted even at the end of pregnancy in hope of securing a controlled case in a living child which can be further cared for after birth.

We have not found the injection of neosalvarsan productive of miscarriages or premature deliveries. With a small initial dosage, gm. 0.3, and an increase to gm. 0.45 or gm. 0.6 in weekly injections, we have seen no harmful results of this nature.

Those mothers who have not completed their treatment before delivery are urged to return for the completion of treatment after delivery. Also they are urged to return to the clinic for examinations and care as soon as future pregnancies are suspected.

It is necessary for every prenatal case to be carefully examined for syphilis. Routine examinations of placenta and fetus for signs of syphilis are of value not only to the child, but of greater value to subsequent children which are born after proper treatment has been instituted upon the mother.

# THE PREVENTION OF STRIÆ GRAVIDARUM, DIASTASIS OF THE RECTI MUSCLES, VISCEROPTOSIS AND PTOSIS OF THE BREASTS IN PREGNANCY\*

BY G. CARL H. MCPHEETERS, A.B., M.D., FRESNO, CAL.

A PRELIMINARY report outlining the methods of the writer for the preservation of the figure-profile of the pregnant woman was published last year.† That report embraced the experiences of the previous two years' practice in the application of the instructions described. Since that report was written another year of still wider application of these methods has elapsed and a total of 500 patients to date have carried out the instructions outlined.

The writer holds that childbearing need not spoil the figure-profile of any healthy woman who will cooperate with her physician during her pregnancies, whether one or many. That childbearing does cause multiple striæ formation, overdistention and diastasis of recti muscles, visceroptosis, backache, groin pains, bladder embarrassment, constipation and ptosis of the breasts in pregnancy and lactation, is well known. As for the women themselves, the fear that childbearing will spoil the figure is commonly expressed by the most intelligent young matrons, many of whom are active in sports and social activities. They have around them a number of examples among their mothers, sisters and friends to show what pregnancy will do for the figure, poise and body carriage. There is no argument one can advance to show them that pregnancy was not the cause of the pendulous abdomen and breasts of their relatives or friends, because it is a fact. It is our duty to show them means by which the havoc of the figure, due to pregnancy, can be prevented.

The idea commonly prevalent among the laity is that the pregnant woman should discard her corset. Most women still practice this and go to term without any abdominal support and no care, whatever, of the abdomen, or the breasts. The results to the figure-profile are familiar enough especially to the patients themselves.

The prevention of striæ should commence in the second or third month of pregnancy; it will not ordinarily be entirely successful if begun later than the fourth month. Spasmodic, irregular massage of the abdomen with one hand, in the manner of the small boy with a colic, is almost without any value. The addition of fats and oils to this unsystematic massage adds little to the results, "Mother's

\*Read before the Section on Gynecology and Obstetrics at the Annual Meeting of the Medical Society of the State of California at Coronado, California, May, 1921.

†California State Journal of Medicine, October, 1921, No. 10.

Friend" advertisements notwithstanding. Persistent, systematic daily massage with both hands, after the method developed by the writer, will positively prevent the formation of striae gravidarum. The patient (preferably a primipara, because in her case the best results can be obtained) is instructed to perform vigorous massage of the entire abdomen and hips for at least ten minutes every night and morning. This should be carried out from the day of her first visit to the office until the date of delivery. It is well to remind the patient that it may not be entirely successful in preventing all striae if begun later than the fourth month, particularly, if the patient gains a large amount of weight. The patient is instructed to divide the skin of the abdomen into imaginary vertical strips, as shown in Fig. 1. She is then directed to begin in the left groin and massage a strip of skin about 3 inches wide, extending upward to the left costal border.

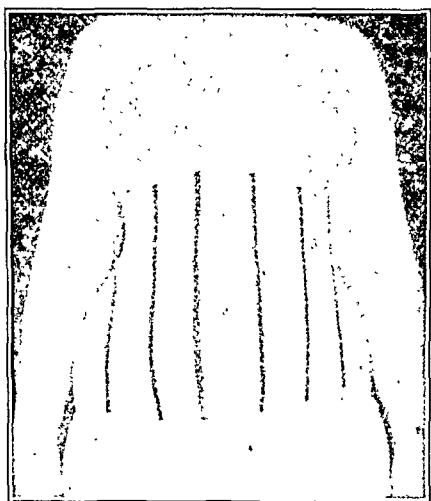


Fig. 1.



Fig. 2.

This may be called strip No. 1. Strips Nos. 2, 3, 4, 5, and 6 are parallel to this and account for the entire skin surface of the abdomen (Figs. 1 and 2). Each strip is to be massaged in turn in a transverse direction, commencing in the groin, or at the pubes, and working upward to the costal margin. This method is systematic and no portion of skin is omitted. The hips are each massaged in like manner.

The patient is placed in the Fowler's position upon the office examining table with the abdomen and hips exposed and shown how to stretch the skin by deep transverse massage with the curved finger tips of both hands. The physician, or attendant, should demonstrate this directly upon the patient's own skin in order to show the degree of pressure and amount of pulling of the skin. The patient is told to press in deeply with the finger tips and pull the skin vigorously until it smarts (Fig. 2). Only in this manner can she really stretch

the deep elastic connective tissue fibers of the corium, which the histologic studies show are the structures disrupted in *striæ gravidarum*.

Should the skin be dry or become irritated after repeated treatment, the patient may dip her finger tips in olive oil, palm oil, or cocoa butter, when beginning massage. Much oil is inadvisable, however, since the finger tips will slip too easily over the skin and no real stretching of the skin will be accomplished. Most patients do not need to use oil until after the massage. The patients are instructed to use one of the oils mentioned on the entire skin of abdomen and hips after completing the massage in order to preserve the soft texture. The patients massage themselves thus, (or have their husbands perform this massage for them) for ten minutes before dressing in the morning and for ten minutes after disrobing at night every day until confinement.

The results of this systematic massage of the abdomen are very gratifying. In all the writer's cases where this massage was faithfully carried out, and was begun before the fourth month, the patients have prevented all *striæ*. In addition, the abdominal skin at term, instead of being tightly drawn like parchment and broken by numerous *striæ*, is soft and velvety and can be picked up by the examining fingers and stretched like rubber. Those patients who begin massage late, and who gain large amounts of weight during pregnancy avoid the long wide *striæ* of the cases who have no care at all, but often present small *striæ* not over one inch in length on the hips and just above the groins on the lower abdominal skin.

The deeper supports of the abdominal viscera, namely, the abdominal muscles, are protected by supporters during the entire pregnancy. The pregnant woman should not wear her dress corset beyond the fourteenth week in average cases. However, she should wear a suitable maternity corset, or, maternity abdominal supporter, fitted by a competent corsetier under the attending physician's supervision in order that he may be assured that the garment is serving the intended purpose of supporting the lower half of the abdomen. Patients who are tall, or of slender proportions can often postpone the fitting of this support until their fifth month without exposing the recti and oblique muscles to undue strain. Short stout figures require the support earlier in their third or fourth month of gestation. The maternity corset, or abdominal supporter, is adjusted thereafter by the same corsetier every two or three weeks, as the abdomen enlarges, until the period of lightening.

And what are the results? The complete relief from backache, the discomfort of distention, groin pains, persistent frequency of urination and fatigue on slight exertion, commends the corset or supporter to every patient who wears it. Most all patients are thereby enabled

to be active on their feet and continue needed physical exercise until actual lightening.

But the most important results of adequate abdominal support during pregnancy are yet to be mentioned. We find no diastasis of recti muscles with the accompanying enlargement of the umbilical space. There is no undue overstretching of the entire abdominal wall, which weakens its muscles for their part in parturition. There are none, or a minimum, of striae. The abdominal wall returns to its former shape and tone quite rapidly after delivery; and finally, and most important, fewer patients are left with visceroptosis. Pregnant women appreciate proper abdominal support more than any other feature of prenatal care, especially, those women who have passed through a previous preg-

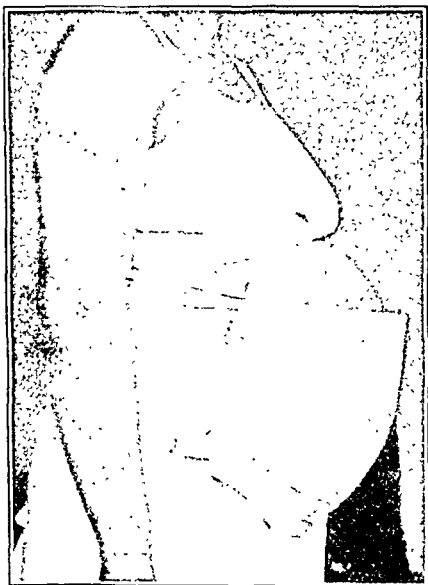


Fig. 3.

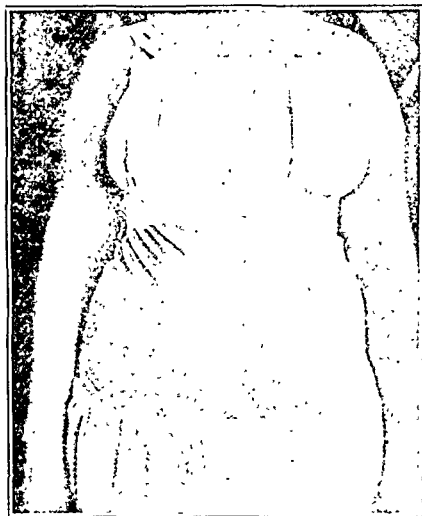


Fig. 4.

nancy without it. Figure 3 shows a side view of the abdominal supporter most often used by the author. It is an inexpensive stock garment. Maternity corsets and maternity abdominal supporters may be made to order in unusual cases.

To preserve the contour nature intended for the breasts is more difficult than to preserve the abdominal walls intact. In the first place, the natural contour of the virgin breasts has often been destroyed by the modern dress brassiere, which flattens and constricts the breasts to conform to fashion's demands for an esthetic bust. Such breasts are often pendulous and exhibit flat or depressed nipples when first seen by the physician. Yet, that very patient frequently says: "Doctor, I do so want to nurse my baby!"

In all cases the patient is directed to lay aside her dress brassiere

when she first visits the office, to begin active daily massage of the breasts with the finger tips or electric vibrator, or both, and to draw out the nipples so they may become serviceable. A convenient time to do this is in the bath, at which time the patient may apply a cold, wet towel as a compress over each breast for a few minutes after such massage. This is useful in reviving the skin tone of flabby, pendulous breasts and in promoting the circulation in the gland tissue long abused by tightly constricting brassieres. Breasts which are particularly flabby and lifeless are subjects for alternating hot and cold wet compresses in the bath for five minutes each after the usual massage.

The physician, or attendant, should instruct the patient and demonstrate to her how to massage her breasts in order that she may do so without injury. She should be taught to roll the breast glands like a lump of dough between the thumb and curved finger tips, grasping the breast tissue about two inches distant from the nipple. This is done for two or three minutes with one or both hands and the massage is completed by gently kneading the entire breast with the open hand in the manner of kneading bread. Some patients exhibit such undeveloped breasts that they are advised to submit to massage and electric vibration with the use of hot and cold compresses for weeks in the physician's office.

In all cases where there are normal breasts, or pendulous, heavy breasts, a specially designed maternity brassiere is put on as soon as possible after the first examination. This is made to the patient's measurement by a corsetier who has been trained to appreciate the requirements of a maternity brassiere. The features of this garment are that it is inexpensive and washable, that it closes in front with hooks and eyelets, that it has an elastic band about two inches wide below each breast and a large box plait running vertically from the elastic band to the shoulder strap over the nipple region to give fullness for the breast and prevent compression of the nipples.

The breasts are supported by this garment as in a basket without constriction, or compression. The shoulder strap fastens in front with button and button hole above the breasts. A series of three button holes close to the end of the shoulder straps allow for adjustment as the breasts enlarge near term (Fig. 4). This brassiere is worn all during pregnancy and the entire lactation period. Women whose breasts develop rapidly during late pregnancy may require a second measurement and a larger brassiere fitted.

Pregnant women as a rule give no attention, whatever, to the breasts unless instructed what to do, fearing to do something harmful, or foolishly believing that the breasts need no care in pregnancy. The results obtained from intelligent, faithful care of the breasts abundantly

repay both patient and physician. Breast feeding has resulted in over 95 per cent of cases, has been prolonged beyond the average time usually quoted and during and after the lactation period a natural, symmetrical bust has remained in the majority of cases, instead of the flabby, pendulous breast, which never had support in time of need.

1021 MATTEI BLDG.

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## A METHOD OF DISPOSING OF THE SPILL IN CESAREAN SECTION

BY EDWARD L. CORNELL, M.D., F.A.C.S., CHICAGO, ILL.

THE disposition of the spill in cesarean section has always been a severe problem, especially in preventing infection. The members of the Chicago Lying-in Hospital Staff have developed the following technic:

The same general principles apply whether classic or low cervical cesarean section is done. Referring to the accompanying illustration (Fig. 1), it will be noted a vacuum pump is used, which is attached to a five liter bottle by means of a rubber hose. Between the bottle and pump is placed a sterile trap filled with sterile cotton. This prevents any contamination from infected material in case the pump should accidentally change its action. The cork in the five liter bottle is made of rubber and has two openings in it, one for the trap and one for the glass connecting tube. To the end of this last connecting tube is attached four feet of thick rubber tubing,  $\frac{5}{8}$  inch in diameter. The tube will not collapse when the pump is working. At the end of this tube is shown a tongue depressor syphon tube which is used in sucking the mucus and liquor amnii from the baby's throat. The trap, cork, rubber tube, and tongue depressor are all boiled with the instruments. The bottle is filled with 10 per cent lysol solution and stored between operations.

As soon as the abdomen is opened, we place a sponge, 24 inches long and about 6 inches wide, covered with dental rubber, inside the abdomen between the uterus and the abdominal wall. This helps to control the spread of the spill. When the uterus is cut the rubber hose without the tongue depressor syphon tube is placed in the wound and the blood is sucked into the bottle. This leaves a clear field for operating. As soon as the membranes are ruptured the liquor is sucked up. It is surprising how rapidly the suction tube will clear the field. If one is doing a Krönig cesarean section, the spread of the spill is limited to a small area. As soon as the child's mouth appears



in the low cesarean section and as soon as the child is born in the classic cesarean section, the tongue depressor syphon tube is placed in its mouth.

Since instituting this method we have eliminated the sloppy looking field, the blood stained gowns and many of the postoperative sequela due to the irritated peritoneum. We also feel that in frankly infected low cesarean section we have eliminated much of the chance of general peritonitis. Another advantage is that the total quantity

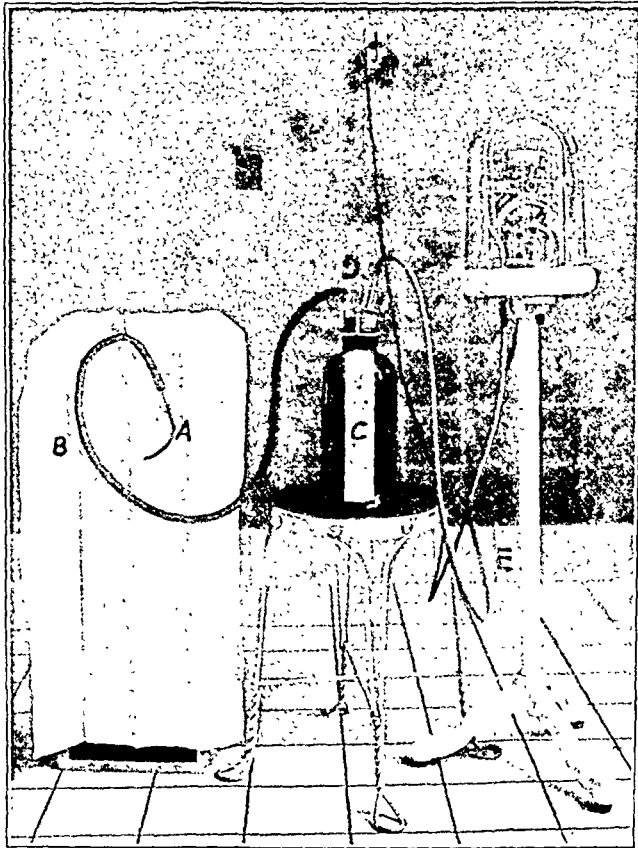


Fig. 1.—Vacuum pump outfit used at the Chicago Lying-in Hospital, for disposing of the "spill" in cesarean operations. (A) Tongue depressor syphon tube. (B) Rubber connecting tube. (C) Five liter bottle. (D) Glass connecting tube on left, metal trap on right, in the two-hole rubber cork. (E) Nonsterile rubber connecting tube from pump to trap.

of the fluid removed can be measured. A graduated adhesion strip on the bottle enables the operator at a glance to tell how much fluid has been removed. We find that in the usual case with unruptured membranes, including liquor and blood, the average is close to 2,000 c.c.

The tongue depressor syphon tube is a special design made by Sharp & Smith.

# Society Transactions

## THE NEW YORK OBSTETRICAL SOCIETY

MEETING OF APRIL 11, 1921\*

THE PRESIDENT, DR. RALPH H. POMEROY, IN THE CHAIR

### DR. GOLDBERGER presented a report of a case of **Ruptured Corpus Luteum Cyst Simulating Ruptured Ectopic Pregnancy.**†

Bleeding from a ruptured corpus luteum cyst can produce all the signs and symptoms of a ruptured ectopic pregnancy and may even be fatal.

The diagnosis in these cases is often impossible before and even after operation unless the specimen is very carefully studied histologically. The writer erred in his diagnosis of the case to be reported, both before and after operation, because the symptoms, signs, and gross pathology closely simulated a ruptured ectopic pregnancy. In fact this specimen was demonstrated as a ruptured ovarian pregnancy before a thorough histological study was made, but with the reservation that no chorionic villi had been found and that the histological study of the specimen was not complete. This only emphasizes again how careful one must be before making a positive diagnosis of ovarian pregnancy. Decidual-like reactions in the ovarian stroma or blood clot without chorionic villi need not necessarily mean an ovarian pregnancy—as on careful study of these cells it will be found that they are corpus luteum cells. Undoubtedly there are cases of ovarian pregnancy reported that on close analysis would prove to be ruptured corpus luteum cysts. The above differential point is especially significant in unmarried women—and should influence the surgeon to withhold his diagnosis until the specimen is studied histologically, unless a definite embryo can be demonstrated.

The case to be reported is that of a married woman, twenty-nine years old, Russian, family history negative. She had measles at the age of six, malaria at seventeen, attacks of pain in the right lower abdomen for the last ten months, not associated with nausea, vomiting or temperature. Menstruation began at fifteen, regular every twenty-eight days, for three days moderate amount. No pre- or post-menstrual pain, last period four weeks ago. She was married ten years, had two living normal born children, nine and six years old, normal puerperia. Two induced abortions by a midwife 5 and 3 years ago, normal convalescence.

Present Illness: Menstrual period 4 days overdue, began by spotting on April 1, 1922, followed by a very severe attack of pain in the right lower abdomen. This pain awoke patient from her sleep, causing her to feel weak, but was not associated with nausea, vomiting or temperature. A physician was called who made the diagnosis of acute appendicitis with abscess and referred her to the hospital. I first saw her on April 2nd at 7 A. M. complaining of pain in the right lower abdomen, pain in both shoulders, and feeling weak and thirsty.

Physical Examination: Patient looked acutely ill. Her face was blanched, respirations were increased and the pulse was 96. The temperature was normal. The heart and lungs were normal. The abdomen was distended and felt doughy. There was slight rigidity in the right lower quadrant and tenderness on pressure, with

\*Program contributed by the members of the attending staff of the Mt. Sinai Hospital.

†From the Pathological Laboratory, Mount Sinai Hospital.

definite rebound tenderness. The cervix was slightly lacerated on the right side, closed and hard. The uterus was slightly enlarged, anterior and firm. There was exquisite pain on movement of cervix or uterus. The right culdesac was bulging and tender. Blood Count: Hemoglobin 85 per cent, white cells 14,200, polynuclears 84 per cent, lymphocytes 16 per cent.

Diagnosis: Ruptured ectopic pregnancy on the right side.

Operation: On April 2nd, laparotomy through a media hypogastric incision. On opening the peritoneum the abdominal cavity was found to be filled with free blood and clots, the source of which was a tear in the right ovary. The right tube, ovary and the clot projecting through its rent was delivered and removed in

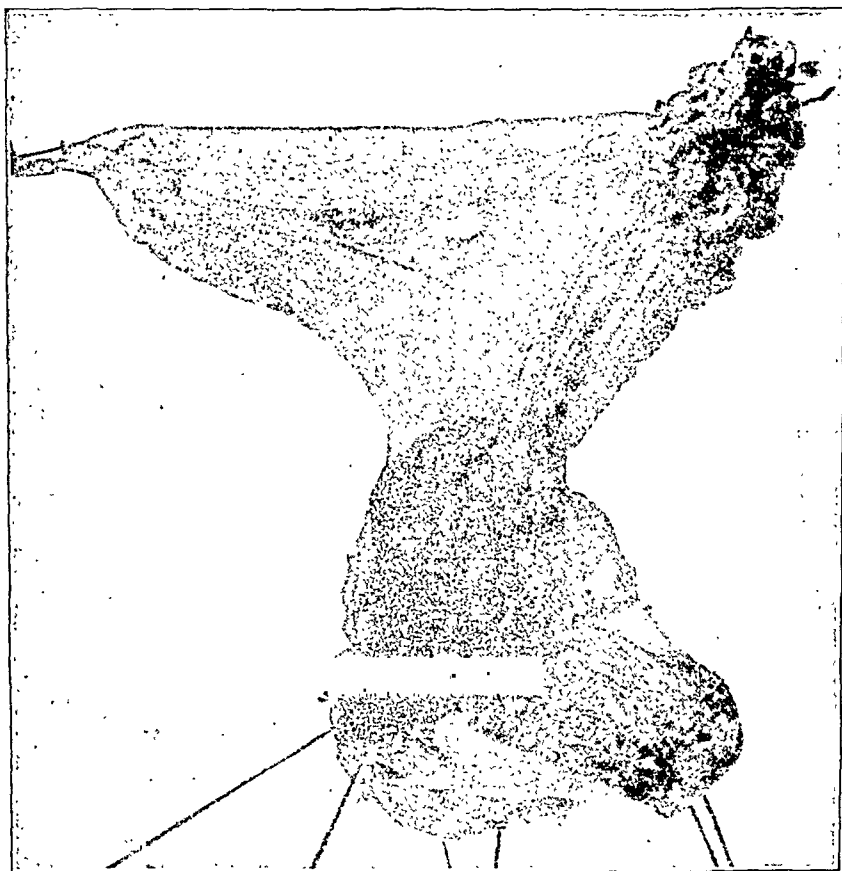


Fig. 1.

the usual fashion. The abdomen was closed in layers. The patient's condition at end of operation was good. The postoperative course was uneventful. The wound healed by primary union.

Pathologic description: The specimen consisted of a tube, ovary and a blood clot which came from the rent in the ovary (Fig. 1). The tube macroscopically was apparently normal and patent throughout, measuring about 10 cm. by  $1\frac{1}{2}$  cm. Histologically, it shows normal tubal mucosa. The ovary measures about 5 x 4 cm. and in its upper outer surface there is a rent which when the blood clot was removed, measured about  $2\frac{1}{4}$  x 2 cm. The cavity was lined by a thin corrugated vascular membrane. On microscopic section it showed ovarian stroma lined by corpus luteum cells.

The blood clot measured  $3 \times 5$  cm. and in its center there was a small, well-defined clot measuring  $1\frac{1}{2} \times 2$  cm. covered by what seemed to be a fetal membrane, but on section was organized clot surrounded by a definite layer of corpus luteum cells. No chorionic villi were found.

Recapitulating: This case presents the clinical picture of an ectopic pregnancy, which on careful histological study proved to be a ruptured corpus luteum cyst.

#### DISCUSSION

DR. W. M. FORD.—It is my intention to present to this Society at some future time a case which came under my observation similar to the one which has just been reported. In my patient the rupture and the onset of the pain developed about four days before the patient's next period was due; in other words, she was not overdue at all. She had pain on the right side and a tentative diagnosis of appendicitis was made. She was not examined vaginally by the surgeons but was turned over to me under an anesthetic in the operating room. On opening the abdomen, the pelvis was found to be flooded with free blood. The tube on each side appeared normal, not even congested. The ovary contained a blood clot as large as a walnut. I assumed I was dealing with a hemorrhage from a graafian follicle; (two or three such cases have come under my observation in the last year or two). Unfortunately I stripped this particular mass of clot out of a cavity in the ovary after removing the ovary and left the tube in the pelvis. Dr. Alexander Fraser, the pathologist surprised me very much when he reported to me several days later that there were chorionic villi in the blood clot which I had shelled out of the ovary. I repeat that the tube was absolutely intact and was left in the pelvis and that I detached the clot from the cavity in the ovary which it occupied so that I shall be unable to exhibit the specimen intact. You will have to take my word that chorionic villi were found in the blood clot in the ovary and that it was unquestionably a case of ovarian pregnancy.

DR. I. C. RUBIN.—About twelve years ago I saw a case of ovarian pregnancy, the clinical details of which I won't trouble you with, but what I was interested in at the time was to establish genuine proof of a true ovarian pregnancy. This specimen undoubtedly presents another addition to the collection thus far made. I should say there probably would be about 40 or more cases including those reported before 1911. At the time I presented my case, there was a collection of some 21 genuine cases. In the case I had there were undoubted chorionic villi in the blood clot, and there was a distinct ovarian capsule. I mean there was such intimacy between the blood clot and the ovary that there was no question about it. The tube was sectioned throughout so as to exclude a very small tubal pregnancy. Spiegelberg, who described the condition many years ago, made that a very important matter, because hemorrhagic corpora lutea are very common. Changes in the epithelial lining of the corpus luteum are very common, and they may resemble trophoblastic cells. In this case I don't doubt that the trophoblast cells are probably genuine, therefore proving their embryonic character. Further sections, as Dr. Goldberger says, will be made. Unless you find a fetus or a small embryo, in the ovary, with chorionic villi, you cannot say it is a primary ovarian pregnancy, until you have excluded any fetal elements in the canal or lumen of the tube on the same side or the other.

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DR. M. A. GOLDBERGER presented A Brief Review of the Physiological and Embryological Genesis of Pseudohermaphroditism, with Report of a Case. (For original article see page 130.)

## DISCUSSION

DR. JOSEPH BRETTAUER.—While I am aware of the possibility of the presence of a rudimentary uterus and of ovaries, in spite of the negative findings under anesthesia, I feel reasonably certain that in this case the uterus was absent, as was also anything which could be taken for a right ovary.

We had permission to remove the penis-like organ, to which the excessive masturbation was due, but had not asked consent to remove the small mass which was distinctly prominent in the right labium majus. The fact that we cannot demonstrate a microscopic section of this mass, leaves the case somewhat in doubt.

The result of the operation was very satisfactory; the general condition improved, although the patient had severe epileptiform seizures.

DR. H. N. VINEBERG.—I would very much question the wisdom of permitting the statement to go out from this Society that because an ovary cannot be found by bimanual examination that such is really the case, as we cannot positively exclude the presence of an ovary by bimanual examination, even under an anesthetic. There is a famous case on record where either Dr. Thomas or Dr. Emmett opened the abdomen and searched for the ovary and didn't find it. It was a case where there was presumably an absence of the ovaries. That patient died of peritonitis subsequently and the ovaries were found at postmortem. There are several such cases on record that I happen to be familiar with.

DR. JOSEPH BRETTAUER.—Where were her ovaries?

DR. H. N. VINEBERG.—One was pretty nearly underneath the liver, the other behind the left kidney.

I happen to have had a case myself in which a woman had no uterus and where she had menstrual molimina and it was necessary to remove the ovaries. The one on the right side I found pretty readily, but the left one I searched for for about fifteen or twenty minutes and was almost ready to give up the search when it was found nearly underneath the kidney. So I think we cannot allow the statement to go unchallenged that because an ovary cannot be found by bimanual examination that it does not exist.

DR. S. H. GEIST.—I believe that not enough emphasis has been laid by the members of the Society on a very important point which Dr. Goldberger mentioned, namely the occurrence of free martin ovaries. That is something that has just recently been worked out in the Hull Laboratory in Chicago. I think it has a great bearing on the question of the development of so-called hermaphrodites. While it is a question in 50 per cent of the cases as to the type of sex organ we are dealing with, this difficulty is undoubtedly due to the fact that in hemaphrodites we may be dealing with the transition stages as seen in free martin ovaries which makes the diagnosis of the gland type difficult. These glands are not active, they do not produce ova or spermatozoa.

I believe the cause of the atypical function of these glands may have much to do with the external genital development of the hermaphrodite and it is along this line that work will have to be done to clear up the etiology of this obscure condition.

Hermaphroditism is no longer a question of the description of external or internal genital appearance; it has reached the stage where progress can be made to determine its cause.

I believe Dr. Goldberger's point in regard to the resemblance of the free martin twin in animals to the hermaphrodite in the human is the first step in this direction.

DR. S. H. GEIST AND DR. J. S. SOMBERG (by invitation) presented a paper on **Preoperative Digitalization; a Method to Reduce Post-Operative Complications.** (For original article see page 135.)

### DISCUSSION

DR. J. S. SOMBERG.—I think that this paper ought to bring out one point of value if nothing more. In the past we have been more or less accustomed to locking the stable after the horse is stolen, so to speak. In other words we have been accustomed to stimulating our patients postoperatively. If we can digitalize these patients preoperatively and stimulate their hearts so as to maintain their blood pressure, we are going to prevent subsequent trouble.

DR. J. O. POLAK.—The paper brings out something Dr. Crile said to me a few days ago, when he remarked, "I have learned one thing in surgery, and that is to do everything for the patient that you ought to do before she needs it", and that is the point that this paper seems to emphasize.

The series of cases which I followed out some years ago showed conclusively that even where the preoperative pulse-pressure—and we take the pulse pressure as the index of the cardiac strength of the patient, excluding of course the cases in which there is hypertension with a very marked discrepancy between the diastolic and systolic pressures—where the pulse pressure was maintained throughout the operation and during the recovery from the anesthesia, there was a definite drop in the systolic pressure, and as the doctor has shown in his series which corresponded identically with ours—a 14 millimeter postoperative drop!

DR. HAROLD BAILEY.—I wish to speak of one thing. These gentlemen in starting this work used the standard tincture of digitalis, but in the latter part they used a proprietary preparation, the exact constituents and strength of which they were probably unfamiliar with. I believe that it is a very much sounder proposition to retain the first principle of digitalizing these patients with a known standard preparation than to use a preparation that is put on the market under a trade name.

DR. F. R. OASTLER.—May I ask for a point of information namely, whether in these control cases that were not digitalized, the results were not rather unusual for postoperative cases? It does not seem that I get six pneumonias following 42 postoperative cases. In fact, pneumonia is comparatively rare on my service.

Another thing I would like to ask is whether in digitalizing these cases Dr. Geist would digitalize every patient irrespective of what the condition might be. He has told us that in digitalizing a normal heart there is practically no effect. The question is: Are we going to digitalize our patients irrespective of the pathologic condition of the patient before operation? Further, it seems to me, offhand, as though a patient who is filled up with digitalis prior to operation is pretty apt to have an increase in the amount of vomiting following operation.

DR. GEIST (closing).—As far as the use of "digitan" is concerned it is also a standardized preparation,  $1\frac{1}{2}$  grains of digitan being equivalent to 15 m. of the standardized tincture. To determine whether the case is digitalized, all the evidence afforded by the electrocardiographic tracings, the pulse and the blood pressure, gives us the desired information. We have learned from these indications, that the amount of digitalis suggested, is sufficient to obtain the

effect on the normal heart. The use of the digitalis preparation in cases with normal hearts or diseased hearts, is of decided benefit as it results in a *maintenance* of the blood pressure after operation, though the pressure and pulse rate *before* operation in a case with a *normal heart* is not influenced. As to advisability of giving all patients digitalis before operation, there is undoubtedly still some hesitance felt due to our old teaching of the method of administering digitalis. The method then was to give digitalis until the patient shows signs of early poisoning. We do not attempt to give that amount, we stop when we get the digitalization effect as shown by the cardiographic tracings. We suspect that in one or two cases there may have been an idiosyncrasy to digitalis just as there is to other drugs in a few people. This may result in digitalis vomiting but it is so rare and so unimportant in view of the benefits derived from the preoperative preparation that it should not be accorded serious consideration.

As to the complications developing in undigitalized cases we may have been fortunate or unfortunate in our statistics, but those are the facts.

DR. F. R. OASTLER.—I would like to repeat the question I asked the doctor before, namely, as to whether or not he digitalizes all patients, irrespective of whether their condition is normal or pathological. For instance, if a patient has a blood pressure of 240/180, is that a case to digitalize prior to operation? What are the indications for digitalis? Do you do it in all cases or only in certain classes of cases?

DR. GEIST.—In all cases irrespective of what the condition is.

*(To be continued in September)*

## THE NEW YORK OBSTETRICAL SOCIETY JOINT MEETING HELD MARCH 14, 1922, WITH THE OBSTETRICAL SOCIETY OF PHILADELPHIA

Reports on the special clinics held during the day by the Fellows of the New York Obstetrical Society were made by the members of the visiting Society after which the following papers were presented:

1. **Some Moot Points in the Diagnosis of the Causes and in the Treatment of Sterility** by DR. BARTON COOKE HIRST of Philadelphia. (For original paper see page 160.)

2. **Unsuspected Male Sterility** by DR. W. H. MACKINNEY of Philadelphia (by invitation). (For original paper see page 165.)

### DISCUSSION

DR. WILLIAM H. CARY.—It is an evidence of progress to have the question of male sterility taken up at the time that the pathologic conditions in the female are also under consideration. I have often stated that at least 50 per cent of sterility can be charged to the male, and that no extensive treatment or operation should be carried out on the female until the secretion of the male has proved to be wholly fertile.

In reference to the genital sense, Graves, speaking before the American Gynec-

cological Society, about the peristalsis of the uterus stated that this was a question that had not been sufficiently studied or proved. As to the value of the genital response in the female, I think there are two things to consider. The first is the excessive secretion of mucus that takes place with normal sexual response. It has been generally taught that this was simply a lubricant, but I am sure it is more than a lubricant; it is a strong alkali, which counteracts the normal acidity of the vagina, and is a preparation for the reception of the male fluid. Furthermore, in a normal sexual response I think that I have proved that there is a peristaltic action on the part of the uterus, and that the male deposit is drawn in the cervix. For that reason I believe we can explain the fact that the douche is so notoriously unsafe in the prevention of pregnancy.

Another matter is the question of under development in the female, which exists much more frequently than we realize. I believe there is a great deal of useful work that can be done in this country in the study of the influence of environment, home conditions, the way our girls are brought up, their health, their clothing and general hygiene from the tenth to the fourteenth year. Thousands of girls could also be studied at the time of their entrance into our big universities and careful data be kept as to the influence of athletics and some of the radical activities that are now being condoned in some of our female schools, such as diving, cold water bathing and all the ordinary activities of the female, continued throughout the menstrual period. What effect excessive athletics and such hygiene are going to have upon the menstrual period and the development of the female genitalia is, I think, a great big subject which is worthy of considerable study and investigation, and I believe that some society in this country could carry out that study to great advantage.

Relative to the question of obesity as to the cause of sterility, I must say that my experiences with it have been very discouraging indeed. I believe if one could succeed in bringing a woman who weighs 225 pounds down to around 165 pounds that it might be possible to accomplish something, but I have been frankly not very successful in bringing about such reductions.

I also wish to say that my experience with glandular therapy, so called, has been very disappointing. I would like to know if Dr. Hirst uses glandular therapy in the treatment of his obesity cases.

Dr. Mackinney brought up the question of frequent intercourse as the cause of sterility. I have had recently three successful results in cases of sterility in which I did nothing but correct such hygienic errors. These couples had been married, curious enough, all between twelve and fourteen months, all of them had been most indiscreet in this respect and the simple correction of this one matter brought about the desired result. It brings about sterility in two ways, first, by lessening the fertility of the male fluid, and, secondly, by bringing about a chronic endocervicitis in the female.

In reference to artificial insemination, I have practically given it up for the reason stated by Dr. Hirst, and because I really can see no indication for it, except in injecting the semen beyond the pathologic or chemical condition in the cervix that is destructive of the semen. Most of these conditions can be cleared up and taken care of much easier and with much less distasteful procedures than that of artificial insemination.

DR. I. C. RUBIN.—The one point that I wish to dwell upon is the safety of the transuterine insufflation test for the determination of tubal patency. Dr. Hirst mentioned the fact that in Philadelphia there were two reports of fatalities from the transperitoneal method. Naturally, I was in fear and trepidation because I thought there might be a fatality *via* the uterus. However, in 448



cases, with some 512 examinations (that is, in those cases where patency was not established at the first instance, where the insufflation was done again some three or four times in order to check up the point of occlusion of the tubes) in my hands and in those of the men associated with the gynecological clinic at Mount Sinai Hospital, there has not been a single fatality, and there has been no alarming reaction in the sense of a peritoneal calamity, nor was there fever, neither did the patient have to be confined to bed because of local peritoneal irritation. That would seem to establish fairly well its safety. Naturally, one has to select his cases. In the very beginning Dr. Polak pointed out that it was theoretically dangerous, and it certainly is dangerous in a certain class of cases. There are cases that have tender pelvic inflammatory masses, associated with a certain amount of febrile reaction, or with a frank purulent discharge from the uterus, a Bartholinitis or a vaginitis. In these cases you are apt to get into trouble with the simple passage of a uterine sound, and you get into trouble if you examine your patient without gentleness. Those cases are to be absolutely excluded from the use of this test. Even in chronic inflammatory cases where women walk about with or without slight pain and with so-called thickening of the tubes, but without associated fever, this test done under the prescribed rules has no bad sequelae.

What is the type of case in which this test is really of some use? It is useful in a number of instances, particularly in the case of the woman who had been married five or more years, in which the male has proven to be potent and where nothing or very little of pathological consequence is palpable on examination. The tubes are not necessarily distended. There are strictures or adhesions about the tubes from one end to the other which are not palpable. In those cases we are sometimes surprised to find as a result of the insufflation test that the tubes are closed. There are other conditions in which this test has a scope; for example, in the cases in which one tube has been removed for inflammatory disease and after years of further sterile marriage the patient wishes to know why she is sterile. There are cases with no gonorrheal infection or pelvic abscess and where a search for the gonococcus is entirely negative, in which, however, there is a history of appendicitis with drainage in girls before marriage, and in cases of that kind sterility may be ascribed to tubes sealed by nonvenereal pelvic infections arising from the appendix and ovary. Then where double ligation had been done for the purpose of sterilizing the patient because of tuberculosis or some other condition and it is desirable to know whether the operation is successful. Two cases of that kind came under my observation. In one case the tubes were found to be patent and in the other, operated about the same time, the tubes were nonpatent, so it is worth while knowing from the standpoint of prognosis, whether ligation of the tubes results in permanent sterilization. In cases where a plastic conservative operation was done, such as salpingostomy, and we wish to know whether the tubes have remained open. In those cases it is well to use this test, not only for diagnostic purposes, but also as a preventive, to keep the tubes open by preventing the sealing over of the lumen.

DR. DICKINSON.—How soon after the operations?

DR. RUBIN.—Ten days. The test is chiefly one of diagnosis and perhaps of prognosis. It is very important to be able to tell the patient that she cannot have babies for the reason that she has a definite cause for the sterility.

The matter of therapy, however, is a more difficult one, and I have never personally made any claims for a therapeutic action in this insufflation method. It is possible that in some cases, particularly where there has been a slight

stricture, that one or two or three insufflations may stretch the stricture sufficiently to establish enough of a patency of the lumen of the tube to make pregnancy possible. To what extent that is going to occur I don't know. I haven't looked up my statistics on that point, but it is my impression that an occasional pregnancy can perhaps be definitely traced to the employment of this method.

DR. F. A. DORMAN.—Dr. Hirst has given us some interesting statistics, particularly on dilatation and curettage and is to be congratulated on the very large series of successes which he has had. I do not feel, however, that we can go all the way with him in rejection of the occasional use of a stem pessary in properly selected cases. I believe that I have seen more than once a uterus with poor development brought up to normal capacity. Of course it must be admitted that the stem pessary is very unwisely employed unless one can rule out the possibility of inflammation further up.

I believe that Dr. Rubin's transuterine insufflation is of very distinct value. It has given me much help and encouragement in a diagnostic way, and I think if Dr. Ward reports some of our cases, he can add some actual cases of conception that have followed the use of this method.

Sterility, of course, affords a perfectly straightforward indication. Besides undeveloped uterus, perhaps our commonest (and this is sometimes disputed) operation is for the correction of retroversion. A support with a pessary may serve the purpose, but better and more certain in cases of sterility is the surgical operation. We also get successes if we discover and treat cervical irritations, which are undoubtedly a very important factor.

I am constantly amazed by the failure to recognize the male factor in sterility. It has been my experience that patient after patient will present a history of previous operative intervention without a satisfactory and adequate study of the male having been made. I recall a case in which the woman had been curetted and had a stem pessary inserted by a very prominent gynecologist. She seemed perfectly normal. I requested the husband to come in to see me. Before I could say anything to him on the subject he said, "Doctor, there is something I wanted to tell you. I think possibly I am at fault," and then he proceeded to tell the story of double gonorrheal epididymitis in the past, and he was still sterile.

Dr. Cary thinks we should never use insemination. I think perhaps insemination of the uterus we should not employ. But I had a case in my practice which illustrates the value of rather frequent vaginal insemination. A study of the husband brought out the fact that he was impotent psychically. He hadn't the ability to have intercourse and never had, although married a number of years. The woman was anxious to have children. I tried insemination of the uterus and nothing happened. In view of the fact that both the man and woman were anxious to have children, it occurred to me to try occasional injections of the vagina with the seminal fluid. The woman was instructed in the use of a syringe so she could manage it herself. She tried it and she has had two children, although she still tells me that her husband has never been able to have intercourse with her. In those very rare cases of psychic impotency, there is still a chance for that particular type of procedure.

I was interested in what Dr. Mackinney said about mumps. Very recently, a patient came in to see me, a perfectly normal woman, and I sent for her husband. He stated emphatically that he had never had any venereal disease. I asked him further if he had ever had any inflammation and he stated that at

the age of 18 he had had a double orchitis, associated with mumps. I would like to ask Dr. Mackinney if he feels that the orchitis and mumps would have an effect adversely in the production of the spermatozoa, even if there existed no atrophy of the testicle.

DR. G. G. WARD, JR.—We have had an extended experience at the Woman's Hospital with Dr. Rubin's technic. I believe we now have a record of some 275 cases in which we have employed this technic as laid down by him, and I can corroborate what Dr. Rubin says, namely, that in that series of cases we have had no fatality, and neither have we had any morbidity as shown by an inflammatory reaction or disturbance that could in any way make us feel that damage had been done by the use of this method.

I can also say that we have had 3 cases which apparently have become pregnant as a result of insufflation of the tubes. Therefore, I can endorse what Dr. Rubin has said so far as our experience goes, and our 275 cases added to his 450 cases make a very respectable number to prove that the method has not a very great amount of risk, provided the conditions which he has laid down are followed.

We have also found that it is important not to make the insufflation anywhere too near the menstrual period either immediately before or possibly afterwards, for the reason that I believe the congestion incident to that process will cause an occlusion of the tubes and, therefore, result in a false test.

I wish to speak of a case in which I think the value of Dr. Rubin's test was very pronounced. She was a well-developed woman, who had been married five or six years, never pregnant, with no evidence of any obstruction that we could make out in the pelvic organs. The husband was first examined and found to be perfectly competent. Bimanual examination showed negative findings. She seemed to have a normally developed uterus, with a patent canal, and I could not feel anything wrong with the tubes. I suggested that it would be wise to have an insufflation test made, which she agreed to. We made four tests on this woman, and each time the mercury column rose to 200 millimeters with no drop (that is the line of safety that we have adopted) and we felt there was no question but that the tubes were occluded. The patient and her husband were told this and they wanted to know what we were going to do under the circumstances. I informed them there wasn't anything that I could do, unless they would permit the abdomen to be opened, when perhaps we might be able to open the tubes and that thereby her chances of becoming pregnant would be very much better than they were at that time. They consented. Two days afterwards I did a laparotomy on the patient. I found the uterus normal, as we supposed and the tubes also were perfectly normal except that at the insertion of the tubes into the uterine cornua, there were two nodules, one on either side, a nodular fibrosis of the tubes which caused complete occlusion. I decided to attempt a plastic procedure, and split the uterus from horn to horn, right into the cavity. It resected each one of those nodules and then took two filiform bougies of fine calibre, as used by the genitourinary surgeons in dilating strictures, and passed them through the outer ends of the tubes and down into the uterine cavity to the vagina, leaving the ends outside of the fimbriated extremities of the tubes. I then implanted each tube into the cavity of the uterus fastening them with a suture. The uterine incision was then closed and finished by the Gellhorn technic, utilizing the peritoneal reflexion of the bladder to cover the vault of the vagina so as to make it secure. The patient made an absolutely normal recovery. At the end of the seventh day I put my finger in the vagina, found the two ends of the filiform bougies and bulled the bougies out. That was one month or five weeks ago. She

was in the office the other day and was perfectly well. Of course, the next thing is to have her come back to the hospital to see if she is patent. I think we will do that in a week or ten days, I feel that the uterus is already healed. If we find the tubes are patent, we will feel that she is in a better condition to become pregnant than she was before.

In response to a question about the cases in the service of the Woman's Hospital, which became pregnant after insufflation, Dr. ALDRICH reported as follows:

In these three cases I do not believe that we can attribute the fact that they became pregnant entirely to the Rubin test. There was one case in particular which I would like to report, in which it did seem that possibly insufflation of the uterus and tubes had something definitely to do with it. This patient was sterile for eight years and had had one child one year after marriage and had had a very difficult instrumental delivery. She had some very bad lacerations and there was an annular constriction of the vagina a short distance below the cervix. We passed gas into the uterus to a pressure of 175 and then it dropped to a very low level, about 45. The patient had one period after that and has since been delivered. Another case came in that had been sterile for five years. We passed gas into the uterus. It did not go to a very high level, about 135, and then dropped. She had no period after that, I believe. She is about to be delivered this week, if she has not already been delivered. The third case that I know of which became pregnant after this test was sterile for three years. She had a very severe endocervicitis. She had a Sturmdorf operation on the cervix. The tubes were found patent before this operation was done and she immediately became pregnant after that healed up.

DR. JOSEPH BRETTAUER.—I would like to ask Dr. Ward why insufflate this woman? Why not wait until you know if she becomes pregnant or not? What is the use of it? Is there anything to be gained from insufflation, except to satisfy your own curiosity?

DR. WARD.—That would be the only reason, to see if the tubes remained patent. I am not sure but that they would become sealed at their uterine ends.

DR. BRETTAUER.—I think the woman should be left to prove that by herself. If after a reasonable time she did not become pregnant, then I think it is time to insufflate her.

Furthermore, I would like to ask Dr. Mackinney and Dr. Hirst a question which is pertinent to the subject, though it does not exactly deal with the subject; but we are not only specialists—we are physicians as well. We know that husbands are at times under very great mental stress and become temporarily impotent and sterile. I have known of several cases of that character. Is it wise, from the viewpoint of a physician, not as a specialist, knowing of these psychical phenomena to tell the man outright, "You are sterile; you will never be able to have a child," or to tell the woman right away at the time of the first visit, "You are absolutely sterile with this husband?" Is that a proper psychologic procedure to follow? I have always been guarded in the way I have told those unfortunate people of the conditions present, and I would like to ask Dr. Mackinney and Dr. Hirst to tell us what they do.

DR. R. N. PIERSON.—I have one case that is similar to that described by Dr. Ward: A twenty-five-year old, well developed, healthy woman married four

years, had had an appendix abscess drained 10 years ago. Her only complaint was sterility. Her pelvic examination was negative. The husband was found to have numerous active spermatozoa. The Rubin insufflation test was done. When the pressure rose to 120, the patient complained of sharp pain on the left side. The pressure rose to 250, without regurgitation of the gas, and was allowed to escape when that pressure was reached. The gas was introduced three times with precisely the same results. The cannula was then removed from the cervix and a considerable amount of reddish-brown fluid escaped from the cervix. Whereas the tubes could not be felt before insufflation, they were easily made out as thickened masses after insufflation. The conclusion was reached that nonpatency existed and a tentative diagnosis of chronic salpingitis and pelvic peritonitis with hydrosalpinx was made. There was no febrile reaction after the insufflation, and the patient was treated with rest in bed and tampons and douches for a month.

After consultation with Dr. Studdiford, the patient chose to take the chance of improvement by operation, though it was made clear that these chances were not good. Vaginal examination under ether showed a cystic mass in the right fornix about 7x5 cm. It was thought to be the right tube and ovary. A moderately thickened mass in the left fornix was thought to be the left tube. The uterus was forward, not freely movable. On opening the abdomen, the intestines and omentum were found adherent to the bladder fold of peritoneum on the right side, as far as the midline. The right tube was markedly distended, kinked and distorted by adhesions throughout its extent; the ovary, scarcely recognizable, was embedded in adhesions. The left tube was markedly dilated and showed a hydrosalpinx occupying its distal two thirds. The ovary contained two small, simple cysts. Insufflation distended the tubes further and ruptured the left hydrosalpinx when the mercury reached 300 milligrams. (It was not intended that the gas be allowed to reach this high pressure.) The right tube and ovary were removed, the distal two-thirds of the left tube was removed, and a plastic done on its proximal extremity.

Insufflation on the fourteenth day after operation showed patency of the left tube, as evidenced by characteristic symptoms on the part of the patient, and by the behavior of the mercury during the insufflation. Insufflation one week later showed, apparently, nonpatency.

In a series of selected cases, whose chief complaint was sterility, at the Sloane Hospital for Women, we have had no bad results from insufflation.

DR. H. D. FURNISS.—I can add another case of pregnancy following insufflation. This patient had had a number of induced abortions, the last one six years ago, and wanted to become pregnant. I insufflated her in July. Four months later she became pregnant and aborted at the second month. In another patient who was married six years, there were during the first year or two of married life a number of induced abortions. I insufflated her to about 220 and the gas went into the abdomen. I believe she has a good chance to become pregnant.

I think those women with tubal inflammations of the type which are not due to gonorrhea are more apt to become pregnant than the distinctly gonorrheal type of sterility.

DR. MACKINNEY (closing).—Dr. Dorman asked about mumps in regard to testicular atrophy. It is a well recognized fact the poison, whatever it may be, of the mumps infection has a peculiar destructive power on the entire testicle. Not only does it destroy the seminiferous tubules of the testicle, but also the

interstitial portion of the testicle and results, as a rule, in complete atrophy of that organ. Why it should select the testicle I do not know. It certainly destroys the testicle, as a rule, almost in its entirety, so that after the lapse of months or years the testicle remains as a small almond shaped body with practically no structures whatsoever.

In regard to Dr. Brettauer's question as to telling patients of their condition, I think one should exercise extreme care in telling these patients of the existing condition. From the gynecological standpoint it is rather easy to tell a woman whose husband is known to lack adequate fecundating properties that it is not wise to do anything upon her in the way of operation until her husband's condition has been corrected, so, from that standpoint, the gynecologist has a rather easy task. From the standpoint of the genitourinary surgeon, or the urologist, who is called upon to give an opinion relative to the male, one must use considerable tact, particularly in cases of oligospermia, and I quite agree with the doctor who says that the condition and number of the spermatozoa may vary from time to time under what we might call simply natural conditions. There is no question that the activity of the testicle is influenced by a great many factors—matters of diet, intense mental activity, anxiety, business worries, mental stress, climatic conditions and things of that kind will influence the testicular activity, and by correcting those factors one may bring about an increase in the number of the spermatozoa. The doctor will recall in my paper I stated that one cannot consider cases of oligospermia as sterile; they should be informed that fecundation is possible, but unlikely, and a reexamination should be insisted upon; and various factors in their history should be taken into consideration and an endeavor should be made to correct those habits. The semen should be examined at intervals after the first examination with the idea of finding out whether any of the factors which have been taken into consideration have increased the number of the spermatozoa.

I have used a number of animal extracts including the testicular extracts, extracts of the adrenal and the anterior lobe of the pituitary, and some of the other so-called ductless glands, and I must confess I have yet to see any appreciable increase in the activity of the testicle following their administration over a period of several months. Still I don't doubt the theory that perhaps these ductless glands have a great influence in sexual development and possibly in spermatogenesis.

DR. W. H. CARY.—I would like to ask Dr. Mackinney if by his remarks in connection with testicular complications, he wants us to understand that seminal defects follow in all these cases, or only in occasional cases.

DR. W. H. MACKINNEY.—In answer to Dr. Cary's question, I would say that there is some degree of alteration in practically every case that I have had the privilege of witnessing. I do not mean to say that the testicle always suffers, but it has just happened that in the cases that I have been interested in, or have had the privilege of seeing, that the testicle has invariably suffered after a period of months and sometimes years; that is, up to two or three years.

DR. BARTON C. HIRST.—As to what was asked of Dr. Mackinney and myself, I think we should be careful not to inform a woman ruthlessly that she is hopelessly sterile. In these cases I lie most unblushingly. In one case I removed both tubes and ovaries, acutely suppurative from a prostitute in Philadelphia and three months later she returned pregnant. No matter what structures I remove I can always assure the patient, remembering this experience,

that pregnancy is perfectly possible. There are at least three patients of mine in insane asylums as a result of having been told too brutally that they could never conceive.

I always use the endocrine products in connection with the treatment for obesity and also employ electric stimulation. I was disappointed not to hear something more about this agent. I would strongly urge on gynecologists the value of this means of treating a sterility due to imperfect development.

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## NEW YORK ACADEMY OF MEDICINE

### SECTION ON OBSTETRICS AND GYNECOLOGY

STATED MEETING, MARCH 28, 1922

DR. WILLIAM P. HEALY IN THE CHAIR

(Continued from page 99)

DR. ROYAL C. VAN ETTEN read a paper entitled **A Review of Seventy-five Consecutive Hysterectomies for Fibromyomata Uteri.** (For original article, see page 169.)

### DISCUSSION

DR. HOLDEN.—I think that most of us realize that preoperative care and careful postoperative management are of more importance than mere facility in operating, as Dr. Van Etten has said. Some four or five years ago I published a paper urging that we turn more attention to preoperative study and care of our patients as essential elements in success. The sooner we come to realize that the operation is a minor detail, and that the study of the patient, the indications, and the preoperative and postoperative care, mean much more than the actual operation, the better will be our results.

I can endorse what Dr. Lee said in reference of Dr. Tousey's case. I feel that surgeons have very definite indication as to which cases should be operated upon and which ones will do well under radium treatment. I feel that any case that can be made a good operative risk should be operated upon inasmuch as results from operation are so good.

One point that I wish to emphasize is that I tie both the infundibulo-pelvic and uterine arteries, but I do not make the final tie until after the tissue has been cut. In tying the infundibulo-pelvic I leave quite a little tissue so that the ends can be cauterized without producing a hematoma.

A matter brought forward by Dr. Polak is open to discussion. It has been stated that from 200 to 300 instances of carcinoma following the retaining of the cervix after hysterectomy have been reported. Probably if we had statistics of all the hysterectomies in which there had been injury to the ureters or hemorrhage, these accidents would offset the number of carcinomas of the cervix that have followed hysterectomy in which the cervix was not removed. I feel that where the cervix is cystic, or eroded, the patient should be made a safe operative risk and the cervix removed, but I do not think women with nulliparous cervixes which are in good condition should be subjected to a complete hysterectomy.

DR. JAMES A. CORSCADEN.—During the past six years I have treated some 250 cases with radiotherapy. My idea of the proper treatment for fibromyomata

of the uterus is to have radium on one table, the instruments necessary for operation on another, and an x-ray plant in the cellar under the control of an intelligent technician. You cannot treat fibromyomata of the uterus successfully without all of these. My ground for making this statement is based on 250 cases coming under my personal observation and some 20,000 cases recorded in the literature.

I wish to emphasize the point that radium and the x-rays are not novelties. It is simply our misfortune that the Germans had radium, used it and published their results in the literature. The early literature on the subject in this country is not very reliable. It has been rightly said that radium is the tool of the surgeon. The introduction of radium is a matter of local technical skill; to use radium intelligently one must be familiar not only with surgical technic but also with the physics of radiation.

Fibroids of the uterus are almost as common as warts and only a small proportion of the cases cause trouble. The dangers from fibroids are, as Dr. Van Etten has pointed out, the dangers of toxemia, of sarcomatous degeneration, and various accidents. Adami has recently published a study of the cases of myosarcoma reported in the literature and he states that few growths become malignant and metastasize. Myoma does not change into sarcoma and it does not predispose to sarcoma. When a cellular myoma is cut on the slant one may get all sorts of artefacts and these have been interpreted as sarcoma. In about 600 cases of myomata examined by a well-known investigator there was only one case of sarcoma, so we need not worry about sarcoma and we may wait until the fibromyoma causes symptoms.

As to the results of radiotherapy on symptoms in the 250 cases—hemorrhage has been controlled in all but four. One was operated upon before we had finished the use of radium; in that case the patient wanted the operation because she began to bleed again. Two bled because we had used radium in the narrow sense improperly in pedunculated fibroids, but those were cases unsuited to operation in which we had to do something because of the distressing condition of the patients. The other patient was operated upon. Pain has not been great in these cases except in dysmenorrhea. If pain occurs at the time of the period it has always been stopped. Pain, however, is more often caused by the associated pathology than by the fibroid itself. If pain is due to pelvic lesions or to fibroids it is removed by operation. Inasmuch as fibromyoma may complicate so many conditions it is necessary to rule out other conditions and to narrow oneself down to the local pathology. The only local lesions we fear are tumors of the ovary and infectious processes. As Dr. Van Etten has brought out, when salpingitis is associated with fibromyoma one has no right to use radium. And here I may say that the dose of radium which Dr. Tousey used in the case he reports is a little less than  $1/4$  the amount needed to produce the result sought. It was much less than 1200 millicurie hours, the standard dose for the production of an artificial menopause. It must be remembered that the action of this form of energy varies inversely as the square of the distance and as I figure it Dr. Tousey gave something like  $1/9$  the dose necessary to produce an artificial menopause. The case serves to bring out the point that in large myomata, radium fails and that this failure has been corrected by the use of x-rays.

I would urge a spirit of precision in the use of x-rays and radium as these agents are very powerful and we have to be on guard against accidents. The point to be emphasized is that those who have fibroids have three therapeutic agents at their disposal, surgery, x-rays and radium.

DR. FENTON B. TURCK.—It is more important to remember, whether it is a malignant growth or a non-malignant growth, that the breaking down of tissue



cells will cause toxemia, that the pathology is the result of tissue autolysis. The absorption of tissue toxins renders these patients bad surgical risks. They are in a pre-shock condition due to the absorption of tissue toxins. If we give animals at certain intervals x-rays in small quantities, a certain degree of immunity will be produced and that is what is accomplished by the treatment of the patient before operation; the patient is immunized against shock by preoperative x-ray treatment with small doses and thus becomes a better surgical risk. This is not a question of mechanics, for we are getting along to where we appreciate that there are certain biological reasons for these procedures. By the use of tissue extract used as an antigen (cytost) active immunity is established. By adding to this treatment the specific antitoxin (anticytost) both active and passive immunity is established.

DR. HEALY.—I want to emphasize what Dr. Van Etten has brought out, namely, that there are a certain number of cases of fibromyoma of the uterus in which there is carcinoma and before resorting to physical agents to clear up the symptoms of fibroid one should do a diagnostic curettage. It would be very unwise to radiate a fibromyoma without first having the uterus investigated by a competent specialist in order to rule out malignancy. As Dr. Corseaden has said the dosage named by Dr. Tousey for radium treatment was entirely inadequate to meet the needs of his case.

I also want to emphasize what Dr. Corseaden brought out, that radium apparently can only be safely managed by a man who can do surgery, because the final question is whether to operate or to apply radium and that cannot be decided until it comes to the immediate carrying out of the treatment. It is not at all an infrequent occurrence for me to say that in my judgment a case is a borderline case and it is not possible to tell until one comes to the actual treatment whether it is better to use radium or to perform a hysterectomy.

There is another field for the use of radium or x-rays. Occasionally we meet with a woman over the age of 35, when the child bearing period is drawing to a close. She has a uterus apparently normal and may suffer from dysmenorrhea and may not respond to the usual treatment for dysmenorrhea. Here radiation of the uterus, with hygienic treatment and nerve sedatives will be successful. Often there is mental depression preceding or coincident with the menstruation, and those cases can be handled very successfully by radiation, either x-ray or radium.

I recently had a patient with pain referred to the region of the left ovary. In another city she had been under operation for the removal of an ovary which the surgeon thought was probably the source of her distress. Unfortunately the operation did not relieve her symptoms at all. The question was whether to terminate these extremely uncomfortable crises by hysterectomy or whether to try radiation. She was treated with radium applied within the uterus, her periods were terminated and all her distressing symptoms disappeared. That was a year and a half ago. I saw the patient ten days ago and she stated that she had been quite well since.

DR. RONGY.—I should like to ask Dr. Van Etten what his experience is in operating on those cases having had radiotherapy before operation, either radium or x-ray. Last year I operated upon two patients who had had radiation, and I found the tissues so hard and so friable that every time I pierced them with a needle, it failed to hold. That is something we must take into consideration before deciding in favor of radiation. We must consider whether there is a possibility that the patient may have to undergo a subsequent operation.

DR. CORSCADEN.—I have had to operate on none of my patients treated by

radiation. However, one was operated upon, and in this case, according to the description of the operation by the surgeon, the operation went along like any other. In other cases the tissues three, four or five weeks after radiation have been found very hard. There is an optimum tissue for operation following radiation, and that is from ten days to two weeks after radiation, because at that time the initial congestion has subsided and the tissues have not had time to become hardened. The dosage of x-ray or radium is an important factor in determining the condition of the tissues afterward.

DR. HEALEY.—I have operated on a patient eleven months after radiation, and I have operated upon a number of fibroids of the uterus after they have been radiated. Just a few days ago I operated on a patient who was radiated last November. In contracting, the tumor mass had pulled down against the bladder causing dysuria. In this case the operation was a simple and easy procedure, though there was a certain amount of edema in the tissues of the broad ligament and between the bladder and the uterus, but nevertheless the planes of cleavage were easily separated and the operation was comparatively simple. In operating on another fibroid which had been previously radiated a year ago, the operation, a hysterectomy, was easily carried out. This case was interesting from the fact that the bleeding had entirely cleared up and the patient was in much better condition. She was distressed however by the tumor mass and it was decided to remove it. This case was of further interest because there were two large tubes the size of a sausage on the back of the uterus like typical gonorrheal pus tubes and whether that was the condition that was giving the symptoms of which the patient was complaining I do not know. In fibroids I have not seen that radiation renders the operation more difficult than it otherwise would be, but cancer is another proposition entirely. If a case of carcinoma of the cervix is inoperable when it comes to the surgeon, it never becomes operable by the use of radium; radium makes the operation more difficult.

DR. VAN ETTEN.—I was glad to hear Dr. Holden say he tied both the infundibulo-pelvic and uterine arteries a second time; it is advisable to follow that plan. It may seem strange to have given so many kinds of treatment but we did not wish to withhold any opportunity that promised benefit to the patient. On the question as to the advantages of radiotherapy and surgery, I am still somewhat in doubt whether several treatments with x-rays and watching may not have advantages; but it is a question whether the operative procedure which is over and done with at one time has not the advantage. With reference to the danger of burns from x-rays and radium, in the earlier series of cases, no doubt a number of patients lost their lives, that radium and x-ray might be advanced. I have seen burns that perhaps should not have occurred. Radiologists are acquiring a knowledge of correct dosage, and many are deserting surgery and following radiotherapy. I have not yet reached that stage. To my mind there are many, many reasons why the operative procedure is to be desired in the majority of cases rather than the use of radium.

# Department of Reviews and Abstracts

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CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

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## Collective Review

### Views of Primitive Peoples Concerning Abortion

BY JONATHAN WRIGHT, M.D., PLEASANTVILLE, N. Y.

THE performance of abortion is a practice almost universal among the primitive tribes of the Pacific Islands and in most of them it is more or less legitimate, or at least often goes unpunished. In Fiji "midwifery is a distinct profession, exercised by women in all the towns, and they are said to be very skillful, performing operations which are among us considered as surgical. Abortion is prevalent, and nearly half of those conceived are supposed to be destroyed in this manner, usually by the command of the father, at whose instance the wife takes herbs which are known to produce this effect. If this does not succeed, the accoucheur is employed to strangle the child, and bring it forth dead."<sup>81</sup> Thomson<sup>82</sup> gives a rather extended notice of the practice, widespread in these islands: "The methods of the Fijians are, as in other countries, both toxic and mechanical. Certain herbs are taken with the intention of preventing conception, but the belief in their efficacy is not general. Some midwives, however, say that, when taken by nursing mothers with the view of preventing a second conception, they result in the death of the child. Another midwife—one of the class to which the professional abortionists belong—assured us that miscarriage resulted more frequently from distress of mind at the discovery of pregnancy than from the drugs that were taken. The abortives vary with the district and the practitioner, but they are all the leaves, bark or root of herbs, chewed or grated, and infused in water, and there is no reason why some of them should not be as effective as the medicines employed for the purpose by civilized peoples, though the mode of preparation is naturally more crude, and the doses more nauseous and copious than the extracts known to modern pharmacy. The 'wise women' appear to know that drugs which irritate the bowel have an indirect effect upon the pelvic viscera \* \* \* Foremost among mechanical means is the *sau*, which is a skewer made of *losilosi* wood, or a reed. It is used, of course, to pierce the membranes, and in unskillful hands it must be a death-dealing weapon.

Indeed, it must more often be fatal to the mother than to the fetus; for Taylor has pointed out that this mode of procuring abortion is only likely to succeed in the hands of persons who have an anatomical knowledge of the parts, and even the 'wise women' have shown themselves to be guiltless of even the most elementary anatomical knowledge. The various methods of inducing miscarriages by violence, such as are practiced by the Gilbert Islanders, who pound the abdomen of a pregnant woman with stones, or force the fetus downwards by winding a cord tightly about her body, are not resorted to by the Fijians, but the practice of *vakasilima* (lit., bathing), a manual operation which midwives are in the habit of performing with the object of alleviating the ailments of pregnancy, does, either by accident or design, sometimes result in a radical cure by causing the expulsion of the fetus. The patient is taken into the river or the sea, and squats waist-deep in the water with the 'wise woman,' who subjects her to a vaginal examination to enable her to ascertain the condition of the *os uteri*, and, through this digital diagnosis, to determine the particular herb to be used locally or internally. Some women assert that the examination under water is adopted for cleanliness only, but most seem to believe that there is virtue in the operation by itself without any subsequent herbal treatment. As there are many practitioners who devote themselves exclusively to this branch of practice, it is more than likely that it is often used as a pretext for an attempt to procure abortion, for a rough manipulation of the *os uteri* may excite uterine contraction, and so bring about expulsion of the fetus. Treatment by *vakasilima* is used in every form of disease in the abdominal region to which women are subject, and the manipulation of the fundus and vagina is so rough that the patient cries out with the pain."

Brown<sup>63</sup> also says that the natives of the islands of Polynesia administer a plant which they declare is an emmenagogue as well as an abortifacient, but in bringing about abortion the old women, who make it their business, use violent abdominal massage after giving the drug and the author ascribes success to this performance rather than to the medicine. The Papuan<sup>64</sup> women either use the sharp roots of a kind of grass, by means of which the intrauterine contents are destroyed and expelled or they pound on the distended abdomen until the life felt within the uterus is stilled. In Africa among the Wanyamwezi "drugs are employed to produce sterility; this and the practice of abortion account largely for the small size of the usual family. The doctors administer drugs for this purpose, but they keep them secret, and it is impossible to obtain any precise information concerning them; that they exist, and are effective, is a certainty."<sup>65</sup> "The red, barren clay from beneath a camp fire is used by White Mountain Apache<sup>66</sup> women to induce sterility." The Sinaugolo<sup>67</sup> woman, who considers

she has had enough children, consults a woman, skilled in the magic for the prevention of conception, but in Australia,<sup>88</sup> around the Carpentarian Gulf, a woman is proud of being with child. Indeed, it seems probable that this attitude towards childbearing is more common in primitive woman than in civilized woman.

It would be interesting to follow ethnological literature further and ascertain the devices to increase the fertility of his women, which primitive man adopts more frequently than abortifacients to destroy the life of the fetus. The story of the placenta and the umbilical cord is a chapter by itself. The problems of polygamy, these and many more connected with the account of the attitude of primitive men towards the preservation and propagation of the species might well engage the attention of obstetricians and pediatricists.

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## Selected Abstracts

### Gynecologic Endocrinology

**Vincent:** The Endocrine Functions of the Female Reproductive Organs. The Lancet, 1922, ccii, 303.

The author believes that since the introduction of the terms "hormone" and "endocrine", a host of writers have seized upon them and dragged them into the discussion of every conceivable biological topic. The terminology of the subject has far outstripped our actual knowledge, and a multitude of round sounding words has crept into medical literature without adequate justification from either experimental or clinical standpoint.

Only one alleged hormone, adrenin, has been chemically identified, and this has not been proved to be a hormone at all. The term "internal secretion" is better in many ways and is at any rate sufficiently definite to describe the little known substances derived from organs which are admittedly organs of internal secretion.

Secretion (internal or external), represents a highly specialized grade of metabolic activity and should be clearly distinguished from metabolism.

The effects of castration in females, both human and animal, is discussed, and the changes brought on by such procedure emphasized.

Ovarian transplantation is considered and the question of possible transmis-

sion of characteristics in the offspring should pregnancy occur following a homogenous transplant carefully gone into.

The author reports that the same cyclical changes take place in transplanted ovaries as in the normal ones.

The effect of the corpus luteum on pregnancy is emphasized and clearly shown by animal experiments. He believes there is no evidence that the corpus luteum governs the fixation of the embryo otherwise than by stimulating the uterine mucous membrane to hypertrophy.

NORMAN F. MILLER.

**Schickelé: Physiology of Ovaries.** *Gynécologie et Obstétrique*. 1921, iii, 170.

Observations on the relationship between ovulation and menstruation make it evident that although rupture of the follicle is more likely to occur during the first eight days, following the cessation of menstruation (17 in 36 observations), it may occur at any time from one menstruation to another.

In regard to the relationship between menstruation and the corpus luteum the following obtains: (1) It is certain that the ovary often harbors a corpus luteum during the eight days previous to menstruation. This corpus luteum is not always found in the same state of evolution. It is certain that one can encounter a corpus luteum at its highest development during the week following menstruation. (2) It is certain that during the eight days preceding menstruation the uterine mucosa undergoes changes characterized by hyperemia and glandular secretion. It is also certain that these changes are not limited to the pre-menstrual period. One can find them during the first eight days following menstruation. (3) Thus, a corpus luteum in the course of evolution will often be present when the uterine mucosa is undergoing metamorphosis. This will obtain more often during the week before menstruation than during the week following menstruation. In spite of this coincidence, the degree of development of the corpus luteum and of the uterine mucosa will not necessarily be the same. The change in the uterine mucosa can take place without a corpus luteum and the latter in evolution may not cause the uterine mucosa to change. Reciprocal independence exists between the corpus luteum and the uterine mucosa. (4) It is certain that menstruation can take place in spite of the absence of the corpus luteum.

R. T. LAVAKI.

**Jacoby: The Endocrine Aspect of Female Sterility.** *Medical Record*, 1922, ci, 239.

The author states that every case of sterility where gross pathological conditions can be excluded warrants a careful study of the individual with a view to determining any malfunction of the endocrine system and the use of the indicated extracts for prolonged periods. In this way many a sterile female may become fecund. The chief factor in the production of sterility is a dysfunction of the ovary. Careful examination of the individual will usually reveal the gland or glands responsible for, or participating in, the ovarian deficiency, which are usually the pituitary, thyroid, and adrenals. The dysfunction of one or the other or several of these glands produces conditions which make it impossible to carry through the entire sequence of pregnancy from ovulation to embedding and growth of the ovum. These conditions may be improved by the use of the proper gland extracts.

C. O. MALAND.

**Godbey: Endocrine Types of Dysmenorrhea.** *West Virginia Medical Journal*, 1921, xvii, 108.

Endocrines play an important part in menstrual life. The hypothyroid girl is small and menstruates very early and there is prolonged menstruation. There

is an overdevelopment of the mammary glands and an abundance of the hair-suit at an early age. In hyperthyroidism the reverse of the above is true, with much dysmenorrhea. This is the eunuchoid type. The ovarian type comes on after menstruation is established. The pains during menstruation are marked and there may be a characteristic pain in the region of the appendix. Ovarian feeding with hypodermies of pituitrin gives good results. The pituitary type is more easily diagnosed and if treated early does well on pituitary compounds and other endocrines.

W. K. FOSTER.

**Puppell: The Internal Secretion of the Placenta.** *Deutsche medizinische Wochenschrift*, 1921, xlvii, 1294.

After repeated animal experiments, Puppel has used his placenta opton in a series of clinical cases. He injects a 7.5 per cent solution subcutaneously. While he claims to have produced uterine contractions with this solution his results do not seem altogether conclusive. In four cases of premature rupture of the membranes, in which the solution was used, three had to be delivered by forceps. In a case of abortion, the fetus was delivered but the placenta had to be removed manually, which is about the usual course of events. His efforts to produce lactation in women with his remedy were futile. In amenorrhea he was able to produce uterine bleeding after from one to six injections. In two cases of dysmenorrhea he achieved painless menstruation after six injections. In a case of primary sterility in a woman married 7 years, the woman conceived, but in a case of one-child sterility no result was achieved.

R. E. WOBUS.

**Guggisberg, Hans: Oxytocic Substances in the Placenta.** *Monatsschrift für Geburtshilfe und Gynäkologie*, 1921, liv, 277.

Guggisberg finds that extracts of all the glands of internal secretion have a stimulatory action upon the uterine muscle, but that this action is most pronounced in extracts of the thyroid and placenta (the pituitary gland being excepted). The activity of the extracts is referred to a proteinogenic amine.

The fluid obtained from the placenta by the Buchner process is free from lipid and protein and is not poisonous for man or for rabbits. From clinical experimental work, it was found that the extract has the most pronounced effect during the first stage of labor. When it is administered in conjunction with pituitary extract, the effect is more marked. Pituitrin works best during the second stage and it is conceivable that this is due to the mobilization during the first stage of some material, which makes the uterine muscle more susceptible to the action of pituitrin.

Clinically the writer uses simultaneous injections of the two extracts (placenta and pituitary), especially during the first stage, when pituitrin alone is of little avail. Shortly after the injection the pains, which were weak and infrequent previously, become stronger and longer, while the interval is shortened. The effect of the extracts continues for a surprisingly long time. Failures were very few and there were no untoward effects on the child. The combination also works well in the second stage but little stress is placed on this action, because it is difficult to determine what part the placental extract plays, since the pituitrin alone is so efficient.

EVERETT D. PLASS.

**Puppel: Therapeutic Use of Placental Extracts.** *Monatsschrift für Geburtshilfe und Gynäkologie*, 1921, liv, 280.

Puppel employed a 5 per cent solution of Merek's Placenta-Opton and gave the preparation intramuscularly but never intravenously. After a limited ex-

perience he draws the following conclusions: (1) Placenta-Opton can be used therapeutically to increase the severity of the pains in any stage of labor. (2) The intramuscular injection of this substance has a good effect upon all menstrual disorders due to hypofunction of the uterus.

**Kratzeisen:** *Animal Experiments with Placenta-Opton.* Deutsche Medizinische Wochenschrift, 1921, xlvii, 1260.

Substantiating the work of Fellner and others, Kratzeisen found that the injection of placenta extract caused a very definite hypertrophy of the female sexual organs of rats and guinea pigs. These changes, consisting of an increase in size, were apparent in immature as well as in mature animals. In young guinea pigs the uterus was fully twice as large in all dimensions after these injections than in the controls. The vagina also showed an increase in size, both the length and the thickness of the walls being augmented. The thickening in each case was due to a hypertrophy of the muscle cells and not to edema. The mammae were also involved, the changes being apparent in the nipples and areolae.

Mature guinea pigs manifested clonic spasms after large doses, which soon subsided, but they showed no decrease in appetite or other reaction. Rats showed no reaction whatever. Unlike Fellner's animals, none of this series showed any parenchymatous changes in the kidneys or other organs which, this author believes, were due to alcoholic and ethereal extracts used by the former.

R. E. WOBUS.

**Martin, Ed:** "Placenta-Opton" as Oxytocic. Monatsschrift für Geburtshilfe und Gynäkologie, 1921, liv, 288.

To test the efficacy of Merck's Placenta-Opton, Martin selected six patients, in whom the membranes had ruptured before the onset of labor. After several hours' observation, in each patient with the pains absent or very weak and irregular, an ampoule of the Placenta-Opton was injected intramuscularly. Within a few minutes after the administration of the drug, contractions became more severe and recurred at closer intervals. In no case was there any apparent harmful effect on mother or child. He was not able to start pains in patients who gave no signs of being in labor, but is quite convinced that rhythmic uterine contractions can be induced by the substance when the patient is at term.

EVERETT D. PLASS.

**Herrmann:** *Specific Ovarian Secretion.* Zentralblatt für Gynäkologie, 1921, xlv, 501.

Herrmann claims priority in the isolation of the lipoid of the ovarian secretion in contradiction to Fellner.

H. M. LITTLE.

**Fellner:** Remarks on the Article of Herrmann and Stein: "Is the Active Substance of Corpus Luteum Specific for Sex?" Zentralblatt für Gynäkologie, 1921, xlv, 568.

Fellner refers to his work, which appeared in August, 1912, and revealed the active substance of the corpus luteum as a lipoid. He found similar lipoids in ovary, placenta, and later also in the testicle, described their solubility, etc. About the same time Iscovesco reported on an active substance of the corpus



luteum—a lipid, but this work was incomplete and he had no knowledge of the lipid of the ovary or placenta. Fellner's work was demonstrated at the Gynecological Congress in 1913. In 1915 Hermann (in the *Monatssch. f. Geburtsh.*) described certain experiments on animals, which supported Fellner's work. It was merely confirmation and dealt solely with specificity on the basis of distillation.

H. M. LITTLE.

**Fellner: Function of Ovaries during Pregnancy (Interstitial Cells).** *Monatsschrift für Geburtshülfe und Gynäkologie*, 1921, liv, 88.

From a series of experiments in which guinea pigs were injected with ether and alcohol extracts of cows' ovaries in various stages of the oestrous development, the author draws several conclusions: (1) The "sexual-lipoid" is present not only in the corpus luteum, placenta, and membranes, but also in the interstitial cells of the ovary; (2) the secretory function of the interstitial cells of the ovary in the non-pregnant animal is very small, but it increases during pregnancy until it is scarcely less marked than that of the corpus luteum; (3) the corpus luteum during pregnancy has the same secretory activity as at other times, and (4) the total secretory function of the ovary is increased during pregnancy by reason of the increased activity of the interstitial cells.

E. D. PLASS.

**Weishaupt: Lipoids in Human Ovary.** *Monatsschrift für Geburtshülfe und Gynäkologie*, 1922, lvi, 276.

A study of a considerable series of human and animal ovaries was made by histological methods using various more or less specific staining reagents to demonstrate the presence and distribution of the lipid materials in the cells. In general it was concluded that the lipid substances are largely concerned with the nutrition of the more important cells of the ovary and that they probably have little to do with its internal secretory activity. The chief argument is that lipid was demonstrated in the ovaries of the non-pregnant woman in the same locations and approximately the same amounts as in the ovaries of pregnant and puerperal women.

E. D. PLASS.

**Hirst, J. C.: The Comparative Value of Whole Ovarian Extract, Corpus Luteum Extract, and Ovarian Residue in Menstrual Disorders.** *New York Medical Journal*, 1921, cxiv, 391.

The author believes that the various ovarian extracts are best administered by deep muscular or intravenous injection. In this way, the nausea, which is a common complaint after oral administration, may be avoided as well as the changes due to oxidation and digestion. He details the technic of administration. As a result of his personal experiences, he formulates the following conclusions: Results are not invariable with any extract but if intelligently used, a good degree of success can be expected, excepting always the use of ovarian residue, where the results are considered decidedly nebulous. Results are often slow, particularly in menstrual disorders, and patience is one of the prime requisites in both patient and doctor. Results are most prompt in the menopause with the whole ovarian extract and in the nausea of pregnancy with corpus luteum extract. The most discouraging results are with the cases of obesity and amenorrhea. Cooperation between physician and patient is needed and over-optimistic statements are to be avoided. The tendency is to expect too much and too quickly.

MARGARET SCHULZE.

**King: Corpus Luteum Extract in the Treatment of the Vomiting of Pregnancy.** Journal American Medical Association, 1922, lxxviii, 484.

King treated 49 cases of vomiting of pregnancy by various methods, 12 of them receiving injections of corpus luteum extract over a variable period of time. Five patients died. He does not share the enthusiasm of Hirst regarding the results obtained from corpus luteum. While some of the milder cases were cured and 2 of the more severe ones improved temporarily the results were such as might be obtained from any form of treatment and were not reliable. He concludes that the best results are obtained from the use of sedatives, colonic irrigations, and the rectal administration of solutions of sodium bicarbonate and glucose. This line of treatment should not be delayed too long in refractory cases.

R. E. WOBUS.

**Frank: The Ovary and the Endocrinologist.** Journal American Medical Association, 1922, lxxviii, 181.

Frank takes up the present wave of unfounded endocrinology, based upon incomplete or faulty observations and fostered by commercialism both in and out of the profession. In exasperation he asks: "What is to be the end of this seemingly uncontrolled wave of mysticism, hysteria, commercialism and credulousness? Does it betoken the birth of another cult, to be controlled by the self-seeker and the charlatan, and which, at least for the moment, will carry along with it the overoptimistic, the uncritical and the untrained members of our profession? If this must be the outcome, the sooner the break occurs the better, then all hail to the 'endocrinopactor'!"

He feels that Goetsch's claim, that the extract from the anterior lobe of the pituitary has a stimulating effect on the sex organs, has been adequately disproved. The only extractable substances having a stimulating effect upon the uterus are the liquor folliculi and the lipoids of the corpus luteum and of the placenta. Since all the commercial extracts of ovary and corpus luteum are "defatted," they are devoid of the only possible pharmacologic action which they might possess. In fact, they have been proved to be quite inert.

From this, Frank does not deduce that a potential ovarian extract cannot be produced. He does maintain, however, that it has not, as yet, made its appearance.

Since, as has again been brought out by Robert Meyer, the *interstitial gland* does not exist in the human ovary, it cannot have any function.

R. E. WOBUS.

**Graves: The Endocrine in Gynecology.** New York Medical Journal, 1920, cxii, 697.

The normal secretion of the ovary is essential for complete somatic growth and sexual development. During adult life, however, the ovarian secretion plays a somewhat minor role in the human economy, as is indicated by the comparatively slight physical changes that take place after ablation or the natural menopause. At this time there is probably a balancing rather than a direct action of the ovarian secretion.

From an organotherapeutic viewpoint, the ovary must be regarded as primarily a homogeneous gland, the essential secreting structures being the interstitial cells. Variations in secretions of different parts of the gland are probably differences of degree rather than of kind. A selective action of the secre-

tin from different parts of the gland is not yet proved and if it exists is probably quantitative.

The therapeutic value of ovarian preparations in the author's experience may be stated as follows: all the ovarian preparations exert a specific influence on hot flushes. In this respect the extract of the residue is the most intensive but the difference in efficacy of the various preparations depends to some extent on the idiosyncrasy of the patient. In the treatment of menstrual irregularities, ovarian extracts exhibit an undoubted specific action but this action is inconstant. In temporary functional amenorrhea, delayed menses, dribbling before and after catamenia, and small clotting, ovarian therapy is fairly reliable and is at least the best asset that the gynecologist at present possesses for these symptoms. Theoretically for these affections the ovarian action may be enhanced by the addition of thyroid and pituitary extracts but in this, clinical experience has not been entirely convincing. For the permanent amenorrheas, especially those associated with pluriglandular disturbances, ovarian therapy has little or no effect on restoring the menstrual function but is of undoubted value in improving the patient's general health. It is best in these cases to administer ovarian treatment in considerable doses separately from the other gland extracts.

In certain types of dysmenorrhea, ovarian feeding is efficacious, occasionally brilliantly so, but it is unreliable or often disappointing after giving early promise. In the severe types of dysmenorrhea, it is of comparatively little help. For hemorrhages and metrorrhagia, ovarian therapy is not indicated.

MARGARET SCHULZE.

**Hellier, J. B.: Case of Osteomalacia Treated by Oophorectomy.** *British Medical Journal*, 1920, No. 3120, p. 587.

The author reports the case of a woman, 38 years of age, multipara, who had not been well after her second pregnancy, 5½ years prior to the time of observation by the writer. She had some spontaneous fractures. Was pregnant when first studied. She had in addition to osteomalacia, albuminuria and anasarca. Labor was induced and craniotomy performed. Subsequently bilateral oophorectomy was done. She showed definite improvement during the year she was kept under observation.

F. L. ADAIR.

## Book Reviews

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**Gynecology for Students and Practitioners.**—By THOMAS WATTS EDEN, M.D., F.R.C.S. (Ed.), F.R.C.P. (Major, R.A.M.C.) Obstetric Physician, Charing Cross Hospital; Joint Lecturer in Obstetrics and Gynecology, Charing Cross Hospital Medical School; Surgeon, Chelsea Hospital for Women; Consulting Physician, Queen Charlott's Lying-In Hospital; Late Examiner to the Universities of Oxford and Leeds, to the Royal College of Physicians and Surgeons, and to the War Office; and CUTHBERT LOCKYER, M.D., B.S., F.R.C.S., F.R.C.P. Obstetric Physician to Out-Patients, Charing Cross Hospital; Joint Lecturer in Obstetrics and Gynecology, and Lecturer in Practical Obstetrics, Charing Cross Hospital Medical School; Surgeon to In-Patients, Samaritan Free Hospital for Women; Senior Obstetric Physician, Great Northern Central Hospital; Examiner to the Royal College of Physicians and Surgeons; Late Examiner to the Universities of London and Sheffield. Second edition, octavo, 928 pages, with 513 illustrations and 24 colored plates. The Macmillan Company, New, York, 1920.

This volume contains in condensed and somewhat modified form the best that was to be found in the three volume "New System of Gynaecology" edited by the same authors. The 24 elaborate colored plates are all borrowed from this same source. The pathology of conditions is well presented, presumably by Lockyer, while the clinical portions receive their due emphasis. This conjunction of clinician and pathologist has worked out well. The book compares very favorably with any of the best standard text books of equal size.

**A Text Book of Midwifery for Medical Schools and Colleges in India,** KEDARNATH, DAS, C.I.E., M.D., Professor of Midwifery and Gynaecology, Carmichael Medical College; Obstetrician and Gynaecologist, Carmichael Medical College Hospitals, Calcutta; Formerly Teacher of Midwifery, Campbell Medical School; Obstetrician and Gynaecologist to the Campbell Hospital, Calcutta; Corresponding Fellow, Am. Assoc. of Obstetricians and Gynaecologists; Fellow and Examiner in Midwifery, Calcutta University; Fellow, Royal Society of Medicine, London; etc., etc., etc. Octavo, 477 pages. With two hundred and eighty illustrations, Calcutta and Simla. Thacker, Spink and Company, 1921.

There appears to be a continuous demand for new, short manuals for the use of students. Such books are usually based upon the course of instructions given by the author. The two books under discussion arrive from far apart regions, the one from Calcutta, the other from New York.

Kerdarnath Das has based his exposition upon his more extensive "Handbook" and emphasizes his indebtedness to J. Whitridge Williams' "Obstetrics". The illustrations are all in simple line and are duly credited to their sources. The text is concise, clear and pleasantly readable. The instruction corresponds closely to that current in this country. Das advocates active interference in abortion, and, for rigidity of the cervix during labor, advises hot douches or baths. Neither of these practices appeal to the reviewer. On the other hand his non-interference in puerperal infection deserves commendation.

Of special interest are certain observations on local Indian conditions. Eclampsia is common (1:84 deliveries). Plague may attack the fetus in utero or 48 hours postpartum. The external measurements of Bengali women average 3 cm. less than those of the British.

The book is well on a par with similar manuals appearing in the United States.

**Manual of Obstetrics.**—JOHN OSBORN POLAK, M.Sc., M.D., F.A.C.S.

Professor of Obstetrics and Gynecology in the Long Island College Hospital; Professor of Obstetrics, Dartmouth Medical School; Obstetrician and Gynecologist to the College Hospital; Gynecologist to the Jewish Hospital; Consulting Obstetrician to the Methodist Episcopal Hospital; Fellow of the American Gynecological Society, American Assoc. of Obstetricians, Gynecologists and Abdominal Surgeons, New York Obstetrical Society, etc. Octavo, 488 pages. With three color plates and one hundred and nineteen illustrations in text. Second edition, containing a special section on Endocrinology. New York, Physicians and Surgeons Book Company, 353 West 59th Street, 1922.

Polak's Manual is in its second edition. The paper and general "make up" are more elegant than that of the book just reviewed. Its illustrations are mainly half tones and are sufficiently numerous, with the exception of diagrams of malpositions, which are conspicuous by their absence.

The exposition is excellent, concise and practical, quite evidently based upon long years of teaching experience. Polak's well-known conservative attitude in obstetrics appears throughout the book and especially in the treatment of puerperal infections.

There are a number of minor points of commission or omission with which the reviewer must take issue. A routine antepartum bath in multiparae should not be recommended. Rectal examinations during labor are not mentioned. Preference for the left lateral prone position is more or less a matter of individual taste. Too many drugs are advocated in the first stage of labor. Either "dämmer-schlaf" of which the author once was an exponent, should be recommended, or a simpler treatment should be presented to the student. To advise two ampoules of pituitrin without further directions, for the prolonged second stage, appears hazardous.

The section on the "ductless glands in pregnancy" is, to say the least, inadequate. Many of the statements are unsound. The reviewer confesses that he does not know what "delayed ovarian secretion" is, and he must likewise plead ignorance to the "protective substances" elaborated by the thyroid, adrenal and other ductless glands.

The teacher, instructing medical students, assumes a great, and perhaps un-

warranted responsibility, when he presents hypotheses to the beginner who is unable to decide upon their value and bearing. This criticism refers specifically to the presentation of eclampsia as due to a "placental toxin", when based upon the discredited experiments of Dold and Obata and bolstered up by a single human experiment of Blair Bell's.

ROBERT T. FRANK.

**Doederlein-Kroenig Operative Gynaekologie. IV Auflage.** Bearbeitet von Dr. med. et Dr. art. obs. h. c. ALBERT DOEDERLEIN, GEHEIMER HOFRAT, O. O. Professor der Geburtshilfe and Gynaekologie; Direktor der Universitäts-Frauenklinik, München. Imp. Octavo; 1028 Seiten; 455 teils farbigen Abbildungen und 15 farbigen Tafeln. Leipzig: Georg Thieme, 1921.

The fourth edition of this important work, of which the first edition appeared in 1905, is a revision due entirely to the pen of Albert Doederlein, Krönig having died in the meanwhile. The chapter on anesthesia has been revised by Erwin Zweifel.

To those familiar with this monumental work, no very radical changes are apparent, although the compass of the volume has been enlarged by 74 pages and 26 excellent illustrations.

The general introductory portion consisting of 204 pages, as in previous editions, embraces a survey of technique, including construction and arrangement of the operating room, hemostasis, avoidance of infection both locally and through the indirect effect of narcosis.

Of the various methods of anesthesia spinal anesthesia is still well thought of, although the primary mortality, in a large series of cases, remains higher than 1:1000. Other methods described are extradural, paravertebral parasacral and local anesthesia. The latter method is said to increase the number of post-operative pneumonias. Postoperative treatment is described in great detail, digitalization and bed gymnastics being recommended to reduce the incidence of thrombosis and embolism. In this connection scrupulous hemostasis and shoulder braces in lieu of leg holders are advised.

Symptoms of the artificial menopause are well presented. Wherever possible at least one ovary should be left, in women under 35 years of age. The ovaries are said to functionate after hysterectomy and should not be removed, and the symptoms of "uteroprivated" women differ from those of "ovariprivated" ones.

Retroversion or retroflexion, if uncomplicated, does not produce symptoms and requires no treatment. Of the innumerable methods of correction, a judicious selection of type operations has been made, although the names ascribed to some of the procedures are unfamiliar to the American reader.

The cystocele operations described fail to make use of the pubocervical fascia, now generally utilized in this country, and resemble the early futile operations of Stolz.

In prolapse of the uterus vaginofixation of the uterus without opening of the peritoneum is recommended in preference to the interposition operation. To the latter a high mortality rate and a high rate of recurrence is ascribed. Hysterectomy for prolapse is likewise condemned.

The paragraphs dealing with atmokausis may well be omitted in subsequent editions.

Vaginal corpus amputation is described and credited to Rieck.

Much space is devoted to the indications for sterilization. To this is added a chapter on temporary sterilization by the x-ray.

A masterly discussion dealing with the methods of treatment of inflammatory pelvic conditions deserves emphasis. In this text book of gynecological surgery nonoperative methods are first described and recommended. Only as a last resort is operation indicated. In younger patients the inflamed ovaries should be left *in situ*.

Radical operations in genital tuberculosis are contraindicated. Various heliotherapeutic methods are lauded.

Routine removal of the appendix during the course of a laparotomy is advised.

The Roentgen treatment of uterine fibroids, of uterine sarcoma and of cervical carcinoma is strongly praised. The five years' cures obtained in the last named disease compare well with the best operative statistics.

Nothing new has been added to either the statistics of results or the technic in treating ovarian neoplasms.

More than 100 pages are devoted to general surgery—hernia, stomach and intestine, gall bladder, rectum, and ileus. These chapters are less detailed and less representative than those of the remainder of the book.

Several new technical procedures dealing with formation of a new vagina by utilizing the rectum, and reestablishment of bladder continence by use of the pyramidal muscles are profusely illustrated.

In the study of the kidney function we note that cryoscopy is still given a place of prominence, while other functional tests receive but scant notice.

The book concludes with a short section dealing with obstetric operations. The extraperitoneal cesarean section is given the preference.—ROBERT T. FRANK.

**The Glands Regulating Personality. A Study of the Glands of Internal Secretion in Relation to the Types of Human Nature.**—LOUIS BERMAN, Associate in Biological Chemistry, Columbia University; Physician to the Special Health Clinic, Lenox Hill Hospital. The Macmillan Company, New, York, 1921. Price \$3.50.

Berman deserves the title of the "Ring Lardner of the Endoerines." Even Harrower's "Hormone Hunger" should be satiated by this travesty on endocrinology. The coining of new phrases, the manufacture of new syndromes, the *reductio ad absurdum* of a new but important branch of medicine might be pardonable from the pen of the advertising manager of some drug firm, but is inexcusable when written by a chemist whose training must have acquainted him with the sacredness of facts.

It is unfortunate that the popular and sensational style in which this book is written may induce many of the laity to receive their first impressions of endocrinology from its pages. The serious minded medical man may derive a transient feeling of amusement from the perusal of its pages, followed by a more lasting one of disgust.

To show that these harsh criticisms are deserved a very few excerpts are appended: "Character, in short, is the grand intravisceral barometer of a personality." "Or there may be an insufficiency of standard pressure in the alimentary tract and we have the ascetic malnourished, striving, uplifting type." (p. 107). "Modern post-pituitary woman is excitement mad and thrill chasing." (p. 212.) "In Napoleon's case the brain attacks may have been crises of pituitary insufficiency in a hyper-pituitary type." (p. 233.)

ROBERT T. FRANK.

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## Original Communications

### CLINICAL AND EMBRYOLOGIC REPORT OF AN EXTREMELY EARLY TUBAL PREGNANCY; TOGETHER WITH A STUDY OF DECIDUAL REACTION, INTRA- UTERINE AND ECTOPIC\*

BY W. A. NEWMAN DORLAND, A.M., M.D., F.A.C.S., CHICAGO, ILL.

EMBRYOLOGIC REPORT BY GEORGE W. BARTELMEZ, PH.D., CHICAGO

#### I

#### A VERY YOUNG TUBAL EMBRYO

ON NOVEMBER 17, 1916, I presented before the Chicago Gynecological Society the wet specimen of a tubal pregnancy removed three days before, together with a water-color drawing showing the exact size and appearance of the tube and gestation sac at the time of removal. Service in the United States army during the war and other unavoidable delays have prevented an earlier complete report of this case. The history of the patient is as follows:

Mrs. K. M., twenty-six years of age, had given birth to a male child six years before the present conception, and had not been pregnant since. There was no history of pelvic disease at any time. The menstrual record was normal, the last period covering from September 29 to October 5, 1916. There was no return of the menses on November 1, and on Friday, November 10, the patient suffered an acute attack of pain in the right lower quadrant of the abdomen which was of sufficient severity to cause her to faint. There was no vaginal

\*Read before the Chicago Gynecological Society, April 21, 1922.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."



bleeding at this time nor any prior to the date of operation. Dr. Norman Kerr saw her at the time of the attack and pronounced the condition either tubal pregnancy or appendicitis. The patient experienced another attack of pain of less intensity later in the same day, and a third attack, also of but slight severity, on Sunday morning, November 12. Dr. Kerr now positively diagnosed a tubal gestation and advised immediate removal to the Polyclinic Hospital. There was at no time any elevation of temperature.

That evening (November 12) I was asked to see her. The examination at this time elicited tenderness in the region of the right broad ligament, but no mass could be detected. The uterus was slightly, but distinctly, enlarged. A presumptive diagnosis of early ectopic pregnancy was made and immediate removal to the hospital advised.

The patient was admitted to the West Side Hospital that evening, and at eight o'clock, Tuesday morning, November 14, I made an exploratory incision. The appearances were those of an early normal intrauterine gestation. The uterus was enlarged as if the seat of a conception. Both tubes appeared absolutely normal; there were no adhesions, no discoloration, and no nodules to be detected by the eye on either side, nor was there any trace of free blood or clots in the pelvic sac. The general opinion of those present was that we had to deal with a very early pregnancy *in utero*. There was a fresh, well-marked corpus luteum on the upper posterior surface of the left ovary. The vermiform appendix was healthy.

I felt, however, that there must have been some cause for the attacks of colicky pain, and on gentle palpation of the right fallopian tube a very minute kernel could be felt near its middle point. The tube was removed and the abdomen closed, the patient making a speedy recovery. An incision on the upper aspect of the tube opened into what seemed to be a normal lumen, but when the incision was extended slightly, a pearl-like globule, as is well shown in Fig. 1, came into view, confirming the diagnosis of a very early tubal gestation. The intact specimen, after its presentation before this Society, was given to the pathologist, Dr. George W. Bartelmez, of the Anatomical Department of the University of Chicago, who made the following report.

*Age.*—It is usually difficult to estimate the age of pregnancies of the first month and none of the early tubal pregnancies that have been reported have any reliable data for determining the age. Our only recourse then is to estimate the age from the stage of development reached by the embryo.

The only young tubal ova in which embryos were found are those of Penkert (1911) and Johnstone (1914). In both the embryos were so badly injured in opening the tube that it is well nigh impossible to place them in the series of young human embryos, at least from the descriptions that have been published.

*Penkert's ovum* came from an unruptured tube removed because of its size and suspiciously congested appearance in the course of an ovariectomy. The cavity of the ovum, as calculated from a fairly complete series of sections, measured  $12.1 \times 7.54 \times 4.75$  mm. The villi at one pole of the ovum were extraordinarily long, to judge from his figure, or else the extraembryonic celom was larger than the figure indicates. In any case, it is probable that before dehydration and imbedding the dimensions of this ovum, including the villi, were

greater than any of those in Table I, which were all measured in formol before dehydration. In an ovum of this size one would expect to find an embryo of 14 to 20 somites and about 3.5 mm. long. The fragment which Penkert identified in his sections probably came from the caudal end of the embryo, but he could not be certain of this. It is impossible to come to any conclusion from his figures and description since what he labels amnion has bloodvessels and blood-islands in its wall. This might, of course, be the region of the amniotic duct in the belly-stalk, but he states that he failed to recognize this latter structure. He concluded that the embryo was in about the same stage as the Strahl-Beneke specimen. This is not at all probable, not only because the chorion is altogether too large but because the structure he has called amnion is also too large. There are two possibilities which this author did not discuss. One is that most of the embryo was lost and that he had in his sections only the primitive streak-end. The absence of lateral body-folds in the sections illustrated militates against this, but the great distortion might have eliminated them. The second possibility is that the embryo developed more slowly than the chorion and, in spite of the presence of mitotic figures, it may have been very abnormal in form. It is not at all uncommon to find an embryonic rudiment resembling a primitive streak in tubal ova as well or in abortions of the first month. Considering the diseased condition of the ovaries of this individual it may well be that the ovum produced was not capable of normal development. In any case, the embryonic fragment gives no reliable evidence as to the age of the pregnancy. Penkert's estimate of the age rests entirely upon his naïve acceptance of the patient's statement that the precautions against fertilization were omitted on only one occasion, namely on the day that a menstrual period was due. This expected period failed to appear. The obvious explanation of this is that the ovum was already implanted in the tube at the time of the supposed fertilization and that the flow was inhibited in the usual manner. This is far more probable than to assume, as Penkert does, that development proceeds much more rapidly in tubal pregnancies and that this relatively large ovum was younger than the Bryce-Teacher specimen. There is no reason to doubt that the ovum before it is implanted must pass through a definite series of transformations which take about eight days, whether the ovum be passed on to the uterus or whether it is held back in the tube. If we add this time to the period that elapsed between the date of the lapsed period and the operation we get a minimum age of 21 days which agrees roughly with the size of the ovum as compared with uterine ova of this age. As we shall see in some cases tubal ova are decidedly smaller than uterine ova containing embryos of the same stage. Certain features of the placental anlage also indicate an age of three weeks or more. They are the great development of 'Haftzotten,' large masses of cytotrophoblast, and the appearance of mesodermal cores in all villi. The author's statement that 'all' villi are already vascularized indicates a four weeks' placenta.

*Johnstone's* ovum was implanted on the fimbria tubæ of a patient who had not missed a period. He gives no dimensions for his ovum, and the embryo was injured mechanically and also somewhat macerated. He came to the conclusion that it belongs in the series between the Glaebecke and the Pfannenstiel-Kroemer embryo. (These are numbers II and III respectively of the Kiebel und Elze *Normentafel*, 1907.) The former is an early neural plate stage; the latter has the neural groove open throughout its entire length. All of the sections that are figured in Johnstone's paper are through the caudal end of the embryo and all show the nervous system as a closed tube. Johnstone concluded that the sections passed transversely through the fragment of the embryo but that they

were oblique in the rostro-caudal direction. Now, since the closed neural tube appears in a section which ventrally passes through the allantoic diverticulum we may conclude that the neural tube was closed practically as far as the primitive streak. This would indicate an embryo of 14 or more somites. Johnstone gives two possible lengths for his embryo based upon the number of sections in which embryonic fragments are present. One is 1.6 mm. the other 2.142 mm. He was doubtful as to whether it was quite normal.

Dorland's embryo is the youngest in which the data permit of a reliable determination of the age. The well-preserved embryo corresponds to certain others which range between 20 and 21 days after the fruitful coitus. Numerous smaller tubal ova have been described, as, for example, by Mall (1915, tables 3 and 13; see especially No. 754) but they are all pathological and there are no data to indicate how long they were implanted or to what extent their growth may have been retarded in obviously diseased tubes.

The youngest normal embryo reported by Mall in this study of 146 tubal pregnancies was No. 808 which was 4 millimeters long. He gives its menstrual age as six weeks.

The clinical data concerning our specimen have been given above. If we assume that the development of the entire product of conception was retarded or halted at the time of the first serious attack on November 10, then fertiliza-

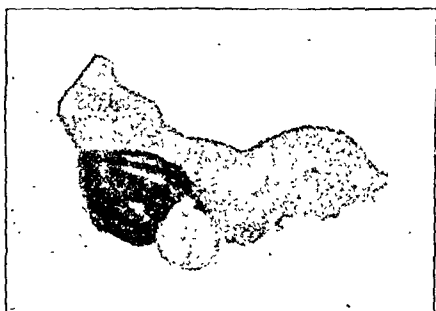


Fig. 1.—Dorland's embryo. Two views of the fresh tube, about natural size.

tion occurred in the third week of the menstrual cycle which began September 29. This is taking for granted that its age is three weeks. Accordingly, implantation began during the first days of November, and a week later the erosion of the tubal wall resulted in a very slight hemorrhage, sufficient, however, to produce the first attack of pain and fainting.

When the tube was removed and opened the ovum slipped out through the incision, for it had been loosened by the hemorrhage and palpation. Only the tips of a few anchoring villi remained in the implantation-chamber which had been excavated in the tubal wall. There are as yet no data as to the appearance of the normal implantation-site at three weeks, and it is therefore impossible to say how far it departs from the normal in this case. As Mall (1915) stated for all of his cases, *there is no sign of any decidual tissue*. Some regions of the implantation-site show a round-cell infiltration; in others polymorphs predominate, and large mononuclear elements also appear usually containing pigment which is probably derived from ingested blood. The villi are similar in appearance to those of ova aborted from the uterus at this stage of development. There is no clear evidence of any phagocytosis of maternal blood-elements by the syncytium of the villi.

To judge from the free hand drawing of the fresh specimen (Fig. 1), the

chorionic vesicle (ovum) measured eight by twelve millimeters. Its dimensions as determined from the sections are 8 x 6 x 4 mm.; the difference between the two sets of measurements represents collapse and shrinkage resulting from dehydrating and imbedding in celloidin. The chorion is rather smaller than would be expected from the stage of development reached by the embryo which had at least fifteen somites. This may be judged from the following measurements of somewhat younger ova recorded in the literature.

TABLE I

DESIGNATION OF EMBRYO	CHORION WITH VILLI	LENGTH OF EMBRYO	NUMBER OF MESODERMIC SOMITES	AUTHORITY
Mall embryo 391	16x14x12 mm.	2 mm.	8	Dandy, 1910
HS7 U. of Chicago Coll.	18x11.3x10.8 mm.	2 mm.	8	Evans & Bartelmez, 1917
Eternod's embryo 'DuGa'	16.3x14x12 mm.	2.12 mm.	9	Eternod, 1896 and 1899
HS U. of Chicago Coll.	21.3x18x9.4	3.3 mm.	14	Bartelmez (unpublished)

All of these ova came from abortions which had probably been mechanically induced, the embryos are normal and the measurements of the chorion are very probably typical of normally implanted ova at this stage of development. It is significant that the chorion of the nine somite embryo "H 98", described by Wilson (1914, p. 344 ss.), is also exceptionally small, as it measured 9x8x5 mm. including the villi whilst still in formol. Now this embryo shows the same pronounced type of dorsal flexure which our specimen exhibits. It came from an abortion, "causation undetermined." Since this specimen of Wilson's had been implanted in the uterus it is not possible to attribute the small size of tubal ova to mechanical pressure inhibiting growth. The real difficulty is probably in the abnormal food-supply. This is clearly indicated by the almost invariable irregularity in distribution of the villi which characterizes ectopic pregnancies. In these cases there are large areas of chorion with few or no villi (*cf.* Figs. 1 and 2). In older specimens there is evidence of degeneration, as Mall (1915) reported, but in our case it is more probable that few secondary villi developed. There is a small group of them where the belly-stalk (*pd.abd.*) becomes continuous with the chorion. At the opposite pole there is a large group which shows well in Fig. 2 (*vii*). Here alone the villi are crowded together in the manner typical of a chorion frondosum. These villi were not apparent in the fresh specimen because they were closely applied to the wall of the tube. The longest villi measure 1.4 mm. in the sections and their structure is typical for this period of development. There are three layers; the mesenchymal core, the Langhans cells (*cytotrophoblast*) and the outer syncytium. The mesenchymal core is being vascularized. It is covered by a single continuous layer of cytotrophoblast which in turn is usually separated from the intervillous space by a continuous sheet of protoplasm with nuclei imbedded in it, *viz.*, the syncytium. At the ends of certain villi—those, in fact, which served to anchor the ovum to the wall of the implantation-chamber—there are large masses of trophoblastic cells with distinct cell-boundaries. All such masses are not necessarily in contact with maternal tissue. When they extend out into the intervillous space and in

sections appear as detached masses they present the appearance of cell-islands and have been described as such (*cf.* Grosser, in Keibel and Mall, "*Manual of Embryology*," 1911).

#### EMBRYOLOGIC FINDINGS OF DORLAND'S SPECIMEN

The tube with the ovum attached was imbedded in celloidin. The sections vary in thickness from about twelve to twenty-five micra and unfortunately all of the sections through the embryo itself were not preserved. It is accordingly impossible to give a complete description of the embryo and much of the interpretation is based on a detailed knowledge of the anatomy of other human embryos in about the same stage of development.

*The Embryo.*—Figs. 2, 3, and 4, give a good general idea of the appearance of the embryo. It was cut as nearly in the sagittal plane as it could be in view of the slight spiral twist of the long axis.



Fig. 2.—A photomicrograph of the wall of the tube and the ovum which had been expressed from the tube after the removal of the latter. Magnified seven diameters. *Emb.*, embryo; *lum.*, lumen of tube filled with exudate and blood; *pd. abd.*, belly stalk; *vil.*, chorionic villi.

The outstanding feature of the external form is the sharp dorsal flexure at the level of the fourth pair of mesodermic somites (*cf.* Fig. 5). In this respect it resembles the nine somite embryo described by Wilson (1914, Figs. 5 and 6). This flexure cannot be regarded as normal since it does not occur in perfectly preserved specimens obtained under the most favorable circumstances. As has been pointed out, the chorion in Wilson's embryo was also exceptionally small.

The embryo, measured in the sections from tip to tip is 1.55 mm. long. For comparison with those embryos in which the dorsal flexure is not present it is necessary to measure it as if it were straightened out. This length is 2.8 mm., and agrees very well with Pfannenstiel III which was 2.6 mm. long before sectioning. Figures 3 and 4, are made from photomicrographs of the two sections nearest the midline, and Fig. 5 is a composite drawing of the salient features of the sections of the one lateral half which is completely represented in the series with the exception of the nervous system.

*Nervous System.*—The nervous system is in the form of a tube open both at the

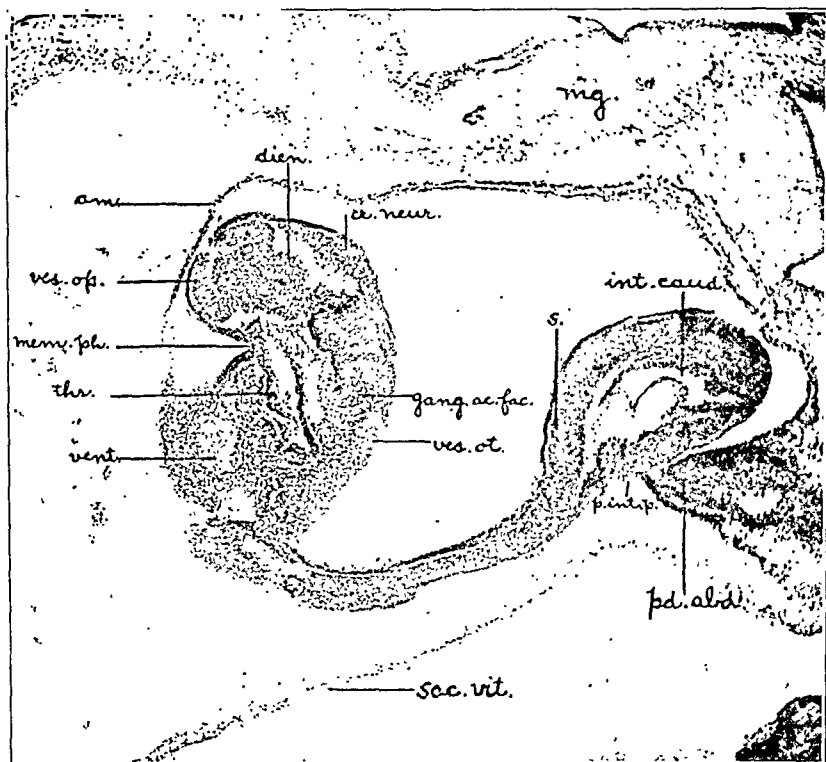


Fig. 3.

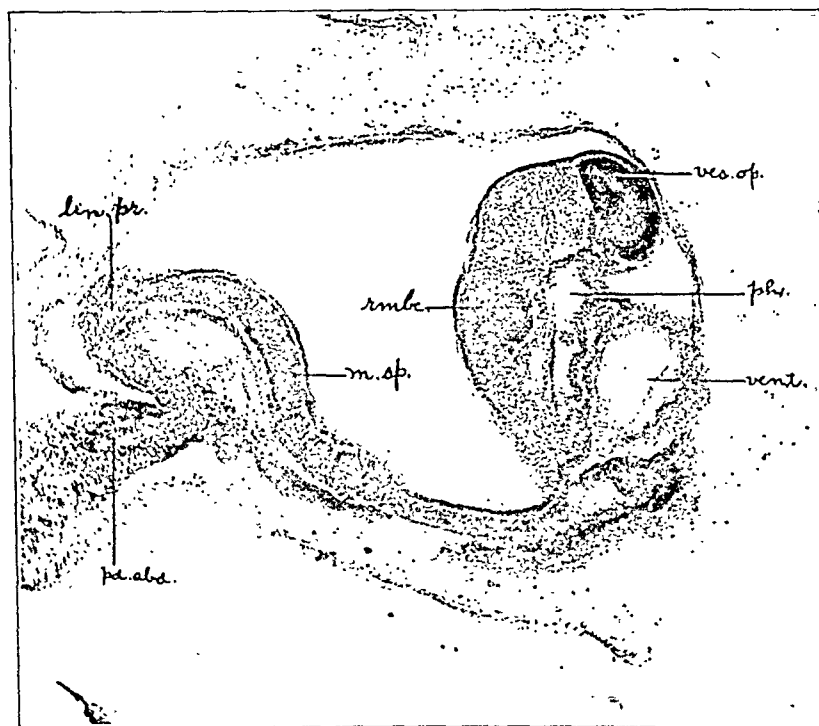


Fig. 4.

Figs. 3 and 4.—Photomicrographs of sections 4 and 5 respectively, through Dorland's embryo. X 45 diameters. *Am.*, amnion; *cr. neur.*, neural crest; *dien.*, diencephalon; *gang. ac. fac.*, ganglion acousticofaciale; *int. caud.*, hind gut; *lin. pr.*, primitive streak; *mem. cl.*, cloacal membrane; *mem. ph.*, pharyngeal membrane; *mg.*, magma; *np. a.*, anterior neuropore; *np. p.*, posterior neuropore; *ph.*, pharynx; *pd. abd.*, belly stalk; *p. int. f.*, posterior intestinal portal; *rmbe.*, hindbrain; *sac. vit.*, yolk sac; *thr.*, thyroid evagination; *vent.*, ventricular loop of heart; *ves. opt.*, optic vesicle; *ves. ot.*, otic vesicle.

rostral and caudal ends. The anterior neuropore appears in Figs. 3 and 5, (*np.a.*) where it is seen to extend at least as far back as the optic vesicles (*ves.opt.*). The latter were cut in the horizontal plane owing to the spiral twisting of the embryo's long axis. They were in contact with the overlying ectoderm, as may be seen in Fig. 3. This is a matter of particular interest because this relation has been found in only one other human embryo (Bartelmez, 1922, No. 470, Carnegie Coll.) and was not present in any of the specimens studied by Bach und Seefelder (1911). The lens will subsequently arise from this overlying ectoderm but as yet there is no indication of a lens-thickening. It is at this time, doubtless, that the ectoderm receives the stimulus for lens-production which the optic vesicle can transmit to any region of the skin, as the striking experiments on transplanting the optic vesicle in the lower vertebrates have clearly shown.

The enlargement immediately caudal to the optic vesicles is to be interpreted as part of the diencephalon (*dien*). Behind it is a gap occupied by the midbrain

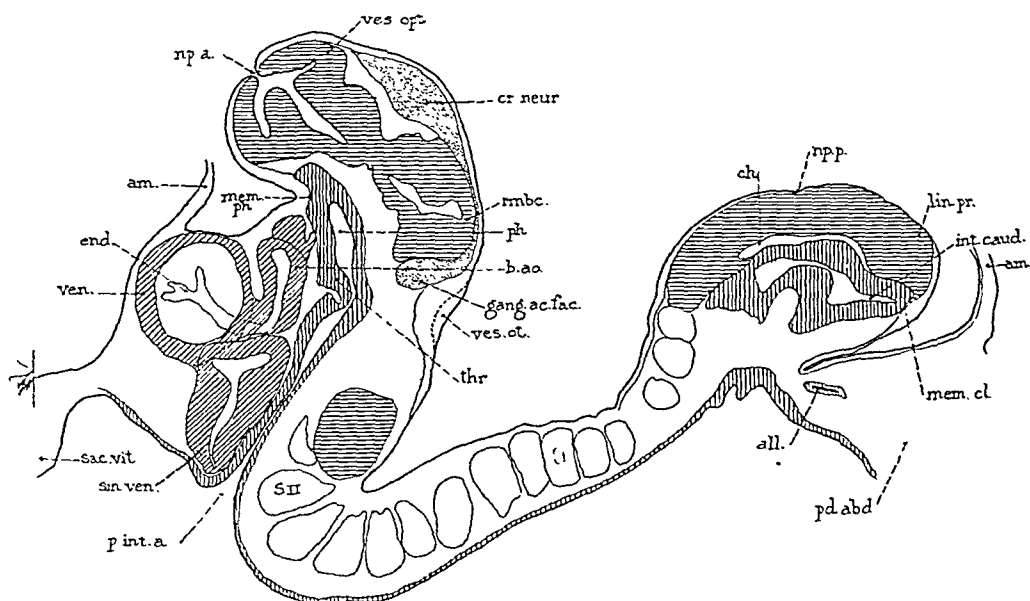


Fig. 5.—A composite drawing made from projections with the Elinger apparatus of sections 4, 5, 6, and 7 through Dorland's embryo, reduced to 66 diameters in reproduction. *All.*, allantois; *am.*, amnion; *b. aa.*, bulbus aortae; *ch.*, notochord; *cr. neur.*, neural crest; *end.*, endocardium; *gang. ac. fac.*, ganglion acoustico-faciale; *int. caud.*, hind gut; *lin. pr.*, primitive streak; *mem. cl.*, cloacal membrane; *mem. ph.*, oral membrane; *np. a.*, anterior neuropore; *pd. abd.*, belly stalk; *p. int. a.*, anterior intestinal portal; *rmbe.*, hindbrain; *sac. vit.*, yolk sac; *sin. ven.*, sinus venosus; *thr.*, thyroid evagination; *ven.*, ventricular loop; *ves. opt.*, optic vesicle; *ves. ot.*, otic vesicle.

or mesencephalon which was lost in the sections. Its position is marked by the cranial flexure (*flex. cr.*). The rostral end of the hindbrain or rhombencephalon (*rmbe.*) appears in Fig. 4, with a portion of the neural crest (*cr.n*) arising from it. Part of this emigrating mass of cells probably enters into the trigeminal ganglion. Opposite the lower end of this part of the hindbrain, the outer or skin ectoderm on either side is thickened and forms the walls of a shallow pit (*ves.ot.*). That is to say, this differentiated patch of ectoderm is beginning to invaginate. We have here an early stage in the development of the otic vesicle from which the membranous labyrinth arises.

At the caudal end the neural tube has not yet closed. The caudal neuropore can be recognized in Fig. 3, and is indicated in Fig. 5 (*np.p.*). Beyond this the

neural folds merge into the primitive streak (*lin. pr.*) which extends around the caudal end of the embryo and is continuous with the anal plate. This thickening of the ectoderm is the outer component of the cloacal membrane (*mem. cl.*).

*Gut.*—As the embryo is still for the most part spread out on the yolk-sac (*sac. vit.*), the greater part of the gut is still in open communication with the cavity of the yolk-sac. The fore-gut has closed as far back as the primordium of the liver. Rostrally there is a well-marked oral sinus (*sin. or.*) separated from the pharyngeal cavity by a thick oral membrane (*mem. ph.*) in which the ectodermal and entodermal moieties are perfectly distinct. A minute spur of entoderm extends rostrally to the oral membrane indicating the presence of the pre-oral gut or pouch of Scessel. These relations may be seen in Figs. 3 and 5. Behind the oral membrane the floor of the pharynx may be seen extending into the pericardial cavity as a shallow diverticulum with thickened walls. This is probably the anlage of the thyroid gland (*thr.*), for it lies just caudal to the level of the first viscerol pouch. Since this evagination appears as a thick-walled tube in the slightly younger embryos described by Wallin (1913) and Low (1908) it is probable that most of it was in the sections of our specimen which were lost. In Fig. 5, it will be seen that the fore-gut turns abruptly behind the thyroid anlage and appears as a straight tube with a narrow lumen opening below into the cavity of the yolk-sac (*sac. vit.*) at the anterior intestinal portal (*p.int.a.*). Owing to the marked dorsal flexure this part of the fore-gut is at right angles to the mid-gut which has not yet separated from the yolk-sac. Accordingly, the rostral wall of the tube is the floor, the caudal wall the roof, of the gut which has been separated from the yolk-sac by the caudally directed progress of the head-fold. From the conditions described by Low (1908) and Wallin (1913) in their specimens we should expect the rostral (really, ventral) wall of the gut in the region of the anterior intestinal portal to be thickened, as the anlage of the liver. Such an hepatic thickening can be made out only with great difficulty in our embryo.

The sections in which the posterior intestinal portal appeared were lost but the section reproduced in Fig. 3, is obviously through the side of this portal (*p.int.p.*). This section shows also a part of the diverticulum of the hind-gut which extends out into the belly-stalk and represents all there is in man of the entoderm of the allantois. Its position is indicated in Fig. 5, (*all.*). Figs. 3 and 5 show the cloacal membrane (*mem. cl.*) clearly.

*Somites.*—The composite drawing of most of the sections of one side of the embryo which is reproduced in Fig. 5 shows all of the somites of that side projected on a single plane. There appear to be *fifteen* fully constricted off from the segmental plate. The first is rudimentary, the second to eighth are longer dorso-ventrally than they are in rostro-caudal extent and have the dermatomes differentiating. The last seven are more nearly square in section as may be judged from Fig. 4, *Plate*, and have enlarged myocoms. In number of somites this embryo agrees with the specimens of Giglio-Tos (1902) and Tandler (1911, "Hal 2"). Only certain details of the nervous system of the former have been published and the description of the heart is all that has as yet appeared concerning the latter, so no detailed comparison is possible.

*Heart.*—The heart is not unlike that of "Pfannenstiel III" as modeled and described by Low (1908) and that of "Hal 2" figured by Tandler in 1911. (Figs. 374-376). These two embryos differ in only one particular, namely, as to whether the primordium of the atrium is single or double. It is impossible to say which is the case in our specimens. In the seventh section of the series, the bulbus



aortæ, ventricular loop, atrium and part of the sinus venosus extending into the septum transversum can be recognized and have been drawn into Fig. 5.

From what has been said it may be concluded that this embryo is closer to Pfannenstiel "III" than any other human embryo of which we have an adequate description. The optic vesicles are distinctly farther along in development than in that specimen and there is one more pair of somites; but on the other hand the gut seems less differentiated. The heart and otic plate agree very well as to their development in both embryos. There is no detailed description in the literature of any specimen intermediate between these two and the twins with 17 to 19 somites reported by Watts (1915).

#### A COMPARATIVE CLINICAL STUDY OF A GROUP OF EARLY ECTOPIC PREGNANCIES

As would be expected, most of the early embryos have been found in the uterine cavity. Caturani (1914) states that "the most accurate study of the literature shows that if the early uterine ova are few, the early tubal are extremely rare." He adds, however, that "the earlier the age of the ovum (tubal) the more reliable the data, as compared with those offered by early uterine ova."

There is a small group of the early tubal pregnancies with which it will be necessary to compare the clinical and histologic findings of the present case in order to satisfactorily determine their relationship. This group will not include the pathologic ova of Mall, nor his youngest normal ovum which had attained to the size of 4 mm., thereby being removed from the class to which my embryo belongs. There remain for consideration, then, only the cases of S. W. Bandler (1912), M. Penkert (1911), F. A. Stahl (1902), M. Caturani (1914) and R. W. Johnstone (1914), which in their clinical manifestations and histologic findings approximate those of my own case.

*The Ova of Bandler and Stahl.*—Bandler's case was reported in 1912 as "the earliest recorded case of ectopic gestation." However, no embryo was discovered in the ovum, which, circular in outline and attached to the upper wall of the tube, measured 3.75x3.5x2 mm. While these ovular dimensions are materially smaller than those of the present ovum, which measured 8x6x4 mm., the absence of the embryo would make it impossible to determine the age of the gestation and would necessitate the grouping of this specimen among the pathologic ova. Moreover, the macroscopic appearance of the affected tubes in the two cases would militate strongly in favor of the younger age of my embryo, although the clinical histories of the cases are almost identical.

Bandler's patient was married two months and complained for a few days after her last menstruation of severe cramp-like pains in the right side. There was, however, no fainting spell. On operation, the right tube presented a purple and congested appearance, and the ovary of that side was enlarged to about three times the normal size and contained a hemorrhagic mass about the size of a walnut. These pathologic findings differ materially from the present case in which a healthy appearance of all the organs was noted.

The specimen removed by Stahl in 1898, which he judged to be of about the second to the third week in age, but in the description of which no reference is

made to the presence of an embryo, must also be grouped among the pathologic ova. The gestation was of the ampullary type of tubal pregnancy, the sac lying within the fimbriated extremity of the right tube. The diameter of the ovule was 7 mm.

*Caturani's Ovum.*—Caturani, in 1914, reported a tubal gestation which, he claimed was not more advanced than three weeks, thus antedating the youngest tubal ovum of Couvelaire, which was 4 weeks old.

Caturani's patient was 31 years of age, and had one child 3 years old. The last menstruation was January 15-20, 1912. On February 17, she was seized with severe abdominal and pelvic pain attended with syncope and a slight show of dark-colored blood. Operation revealed a moderate quantity of free blood in the abdominal cavity, but no clots. A slight punctiform rupture was found in the upper part of the isthmic portion of the left tube close to the uterine end. A corpus luteum of pregnancy existed in the left ovary. *No embryonic area was found*, probably, as Caturani states, "due to trophic disturbances, as is borne out by the relative disproportion between the blastocystic formation and evolution of villi." It should be remembered, however, that it is possible for a normal development of villi to take place in the absence of the embryo. The findings thus recorded necessitate the grouping of this specimen among the pathologic ova.

*Penkert's Ovum.*—Penkert's specimen was removed from a woman 32 years of age, who had been sterile for two and a half years. Her menses had always been regular. The last menstruation occurred on March 6, and the flow was due again on April 3. She indulged in coitus on the night of April 3-4 and a few days later suffered severe abdominal pain, her menses having failed to appear. A physical examination showed the uterus to be enlarged and retroposed. There was a small elastic tumor the size of a child's head in the left side of the pelvis adherent to the surrounding structures; also, in the right side of the pelvis near the uterus was a tumor the size of a pigeon's egg. Laparotomy was performed under spinal anesthesia with tropocain. The left ovary showed a cystic tumor; on the right side was a pigeon-egg sized ovary with three cherry-sized cysts. The right tube was as thick as a little finger, bluish-red in color and adherent, and contained the gestation-sac already described.

*Johnstone's Embryo.*—In May, 1914, R. W. Johnstone, of England, reported a very early ovum embedded in the infundibulum of the left tube, the recent corpus luteum being located in the right ovary. The specimen was accidentally discovered during a Gilliam operation for retroversio uteri. It was a case of primary infundibular attachment, not a tubal abortion. The size of the ovum was 2.73x6x5.6 mm.; it was flattened and almost circular in outline, and about the same size, Johnstone claimed, as the ova of Rossi Dorio and Eternod. The embryo measured 2.1x1.6 mm., and Johnstone estimated its age at about twenty days.

As in my case, the tubal attachment showed no trace of true decidual reaction in the form of decidual cells; but there was a very obvious invasion of the trophodermic elements into the tubal walls, both cells and syncytial masses being found at some little distance from the surface. The entire stroma of the tube at this point was in a most chaotic state of disarrangement, which Johnstone attributed to the lack of the protective action of the decidual cells which were absent. The embryologic findings of this case and their relative

stage of development as compared with my embryo have already been noted.

#### DETERMINATION OF EMBRYONIC AGE

The question of paramount interest in the scientific study of early embryos concerns the age of the given case. Unfortunately, we have no accurate criteria by which we may exactly estimate this, since we know practically nothing concerning the relationship existing between the processes of ovulation, menstruation and fertilization. Could we but know the exact time of the meeting of the ovum and the fertilizing element this question would be settled for all cases. Even in those instances in which it is positively known that but one coitus has occurred, there will remain an indefinite period of several days during which time fertilization may occur. Nevertheless, Teacher and Bryce (1908) consider single coitus a very important factor in determining the ovular age, and it must be admitted that if but one coitus is positively known to have occurred the question of age has been narrowed down to a limited number of days. Then arise the perplexing questions of the actual place of meeting of the sexual elements, the rate at which both spermatozoon and ovum can travel in the genital tract of the woman, and the time during which an unfertilized egg can survive in the peritoneal cavity or fallopian tube; also, how long it is possible for the spermatozoon to retain its vitality and fertilizing power within the female genital tract. Still another element of uncertainty arises from our total ignorance of the exact time of expulsion of the ovum from the graafian follicle. According to Leopold and Ravano (1907), in only 62 per cent of the cases is there a synchronism in the two phenomena of menstruation and ovulation; consequently, in 38 per cent of the cases ovulation may occur at any time other than during menstruation, and in these women conception may occur then, the exact time of fertilization remaining a matter of great obscurity.

Von Spee and Minot believe that from seven to eight days elapse from the time of fertilization in the tube until implantation occurs in the uterine fundus. With this estimation as a working basis it is possible, by noting the stage of development of the embryo proper, to arrive at a pretty accurate estimation of the age of the embryo. This will include the condition of the chorion of the blastocyst, the presence or absence of a cellular layer in the trophoblastic process, the presence or absence of an arrangement of the thin mesoblast in a dense layer around the chorionic wall, and the presence or absence of indentations of the wall (Teacher and Bryce).

The ingenious formula devised by Mall for determining embryonic age, which formula is expressed by the equation,

$$\text{days} = \sqrt{100} \times \text{length of embryo in millimeters,}$$

while approximately accurate, will not give satisfactory results in every instance.

#### SUMMARY

The interesting and outstanding features of this case are the following:

1. I believe we have here the earliest recorded tubal pregnancy.
2. The embryo, measuring but 1.55 mm., or, when the dorsal flexure is straightened, 2.8 mm., and showing but 15 somites, groups itself among the smallest of all recorded embryos.
3. The fallopian tube shows no sign of decidual tissue.
4. A sharp dorsal flexure in the outline of the embryo closely corresponds to that noted in Wilson's embryo, is not a natural condition, and probably was produced by the contracted position of the ovum in the tube.
5. The unusual relation of the optic vesicles, which are in contact with the overlying ectoderm.
6. The very early stage in the development of the otic vesicle.

*(To be continued in the October issue.)*

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## WHAT IS THE RELATION OF HYPERTENSION TO FIBROID DISEASE OF THE UTERUS?\*

### A CLINICAL STUDY

BY JOHN OSBORN POLAK, M.Sc., M.D., F.A.C.S., AND EDITH A. MITTELL  
AND ANNA B. McGRATH, BROOKLYN, N. Y.

MUCH has been written relative to the effect of fibroid disease of the uterus upon the cardiac muscle. Many of the older writers gave us the impression that there was a definite association between uterine fibroids and disease of the myocardium, and as recently as within the last decade our esteemed Fellow, Dr. Herman J. Boldt, wrote in reference to the fibroid heart. McGlynn, in a later contribution, supported by clinical study and autopsy findings, discredited all influence of fibroid disease on the cardiac muscle, attributing the changes found in the heart muscle, not to any definite toxin or toxicity indigenous to fibroids but to a consequent and progressive secondary anemia.

Personal observations on a large number of women who have been followed for periods of from 5 to 20 years, and in whom we have seen fibroid disease of the uterus develop, and whose blood pressure and cardiac state has been carefully observed during all this period, sug-

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\*Read at the Forty-seventh Annual Meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

gested to me that possibly there was some relation between fibroidal changes in the uterus and hypertension. In order that we might arrive at some definite clinical conclusion on this matter, I have had the histories of 416 patients suffering from fibroids, who have been under our care during the past five years, reviewed, studied and their blood pressure readings grouped. The graphics of these readings will show at a glance what the effects of fibroids are on tension.

In this study, we have divided our cases into (a) those in which the fibroid was associated with hypertension prior to operation; excluding the other causes of high blood pressure, antedating the presence of the tumor, such as the presence of kidney lesions or cardiovascular disease where there was a history of such conditions; (b) those fibroids associated with low pressure; (c) the effect of menorrhagia,

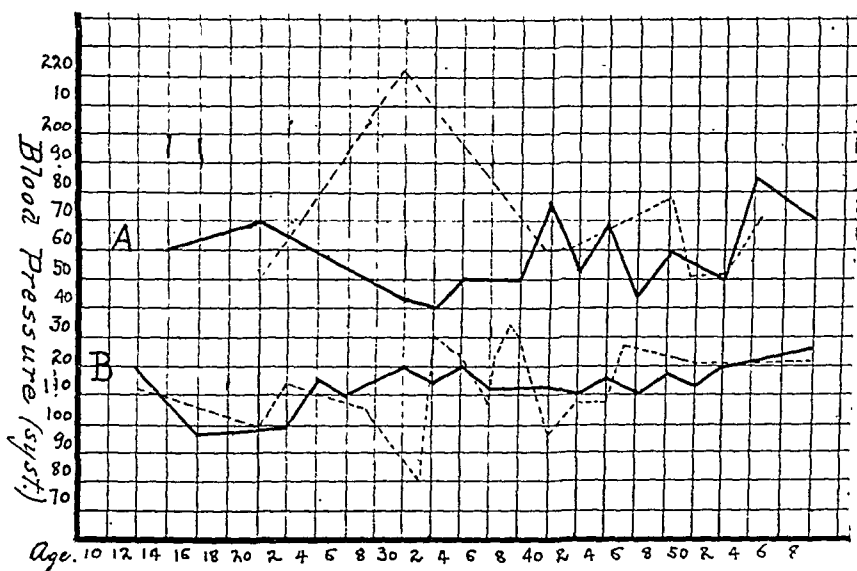


Chart I.—Showing curves of hypertension (A) and hypotension (B) in a series of 240 cases of fibroid of the uterus. Hemorrhage was present in 58 per cent of 82 cases of hypertension and in 59 per cent of 168 cases of hypotension. The solid line refers to the preoperative readings, the dotted line to the postoperative.

when continued over a long period, on the blood pressure of the woman; (d) the effect of hysterectomy with the removal of both ovaries, on the subsequent pressure of the individual; (e) the effect of hysterectomy with the conservation of one or both ovaries, on the subsequent behavior of the woman's pressure; and finally (f) the effect of radium and x-ray treatment in the management of fibroids for the control of hemorrhage, or reduction in their size on the cardiovascular system.

Fibroids associated with hypertension, have usually been found in women over forty, the average age being forty-six, and in those who have been the subject of renal or cardiovascular changes. All of these women have had careful and exhaustive pre-operative study,

including auscultation of the heart, pressure readings at rest, after moderate exercises and after active exercise. Their kidney function has been carefully investigated chemically and microscopically; and where their urinary output has been questionable, as shown by a low phenolsulphonephthalein elimination, study of the blood chemistry has been made to determine the urinary retention.

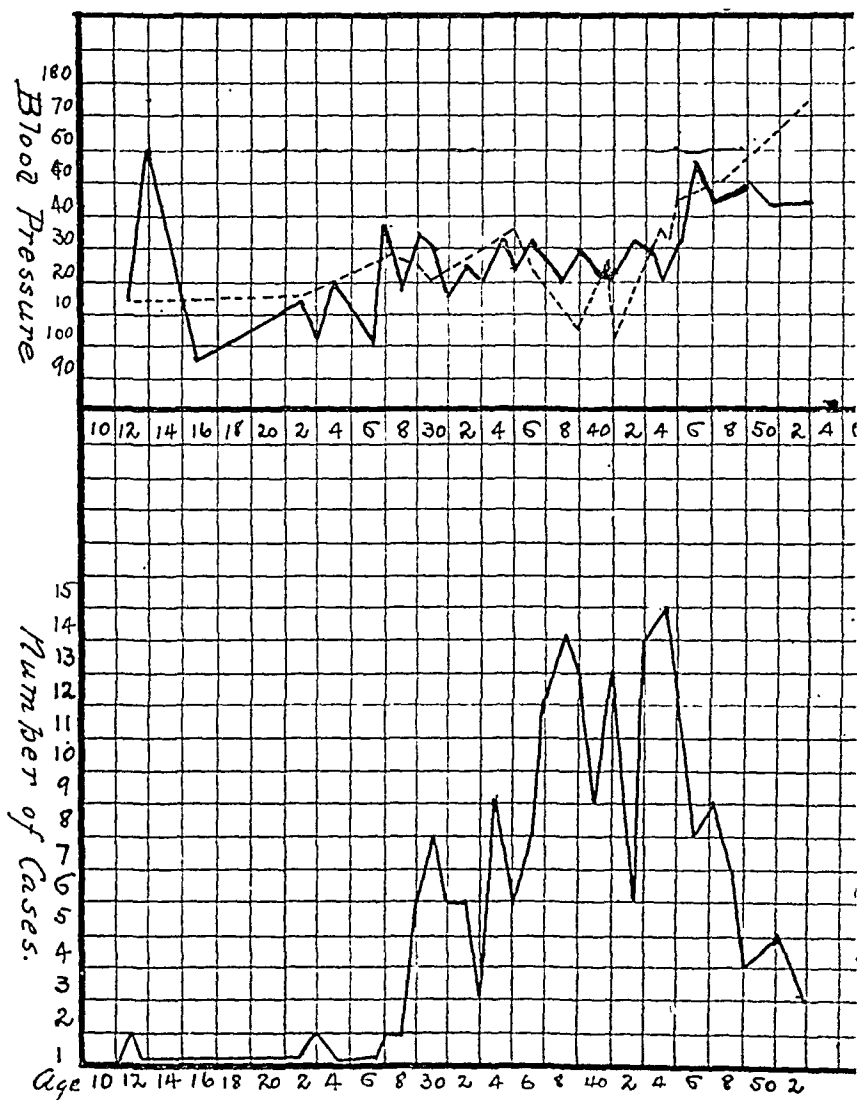


Chart II.—Showing that profuse bleeding and hypertension are coincident with increasing age in this study and that tension temporarily rises after operation. The solid black line refers to preoperative, the dotted line to postoperative, blood pressure curves.

Hence, we feel that the cases included in this group may properly be considered as fibroids associated with essential hypertension, not to any intercurrent lesion. (Chart I.)

In the second group we have included those fibroids associated with low pressure, hypotension. These cases have been found among

relatively young women where the fibroid has either produced no symptoms, or where there was no knowledge of the existence of a tumor until the patient presented herself for a general physical examination. Some few cases in this class presented immense tumors and gave a history of abdominal enlargement over two or more years; yet cardiac examination and blood pressure readings showed little or no disturbance. (Chart II.)

In the third group we have considered the cases of fibroids associated with a prolonged history of menorrhagia and its effect on pressure. These patients have not fallen within any definite age

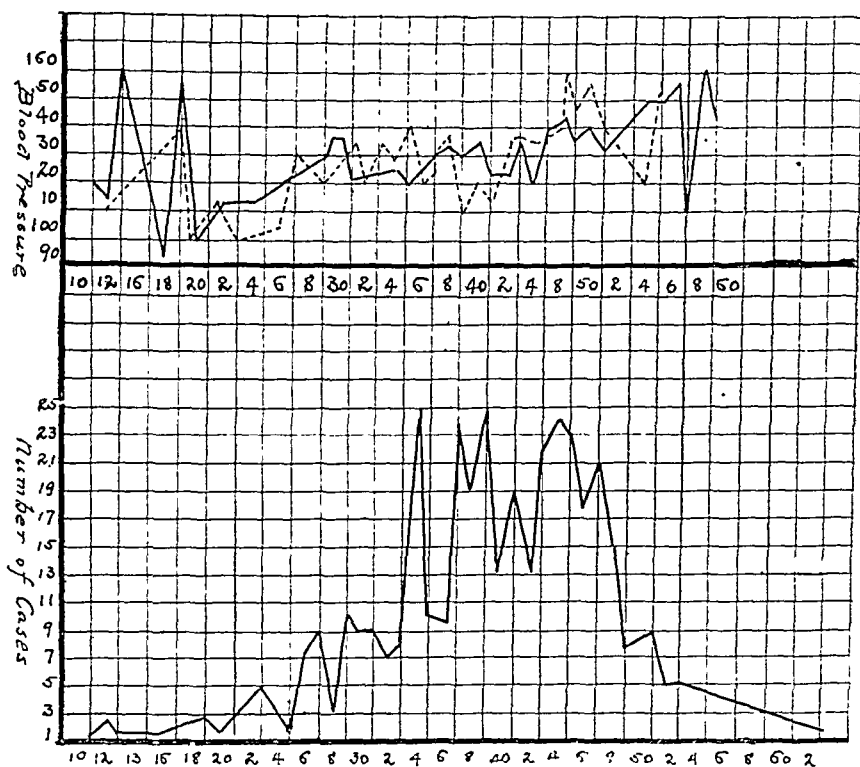


Chart III.—Showing systolic blood pressure in 416 cases of fibroids in the upper curve and the age incidence in the lower. The solid line refers to the preoperative and the dotted line to the postoperative observations.

limit. The secondary anemia has at times been profound, and usually as will be shown in the graphic, the pressures instead of being lower, as one would expect in exsanguinated patients, were higher than the normal pressure to the age would seem to justify.

Age appears to play an important rôle in the bleeding cases—women between 38 and 48 having the highest pressures as well as losing the largest amount of blood. (Chart III.)

In the fourth class we have included those women who have had a hysterectomy with ablation of both ovaries, and noted the effect

of breaking the endocrinal balance on their subsequent pressure. (Chart IV.)

In the next class we have endeavored to demonstrate that the retention of an ovary or ovaries after the uterus has been removed leaves the woman with a lower pressure than when complete ablation has been done. Unfortunately this graphic does not justify this conclusion. (Chart V.)

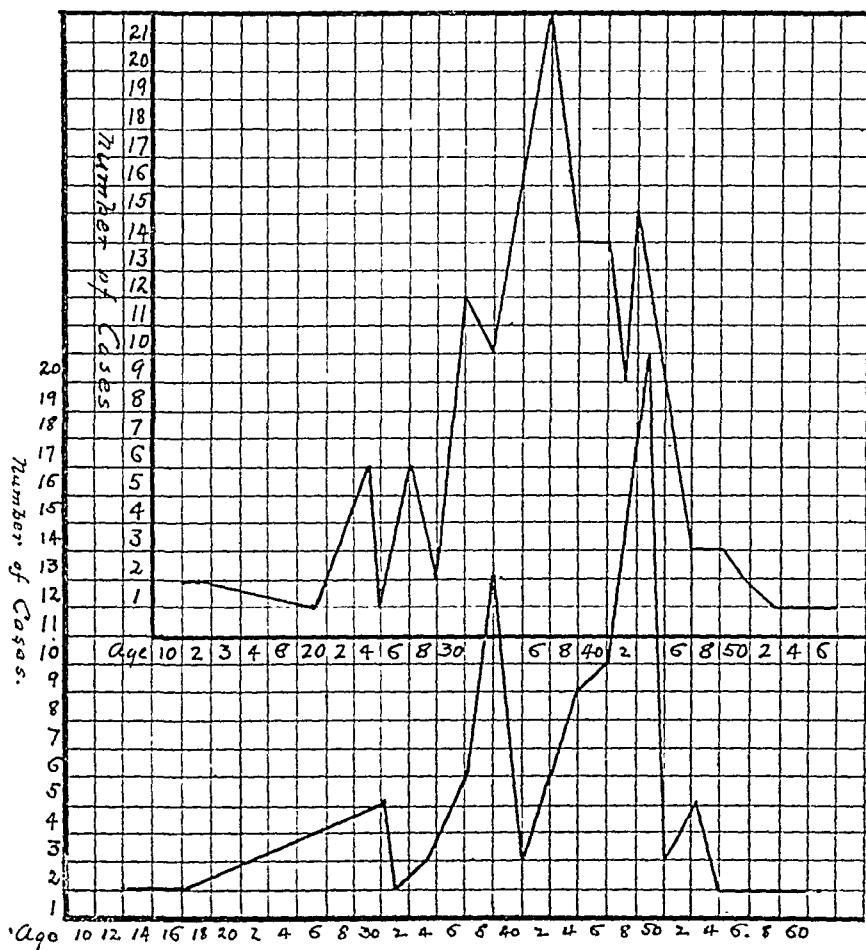


Chart IV.—Showing hypertension curve (below) as compared with age, with the maximum occurrence at forty-nine years. Upper curve shows the hypotension curve as compared with the age, with the maximum occurrence at thirty-eight years.

The final class shows the effect of radium and x-ray on fibroid and the subsequent pressure of the woman. This class is rather disappointing for a large number of these patients were poor operative risks, having cardiovascular or renal disease, and radium treatment was selected instead of operation for these reasons.

#### CONCLUSIONS

1. That there is no effect on blood pressure that can be attributed to the presence of fibroids in young women.



2. That patients with myomata who have high pressure are usually over forty years old, or near the time of the climacteric, or are the subject of renal or cardiovascular disease.

3. That bleeding in fibroids seems to be salutary and has no direct effect on pressure, but when suddenly checked by operation or radium, temporarily raises the pressure.

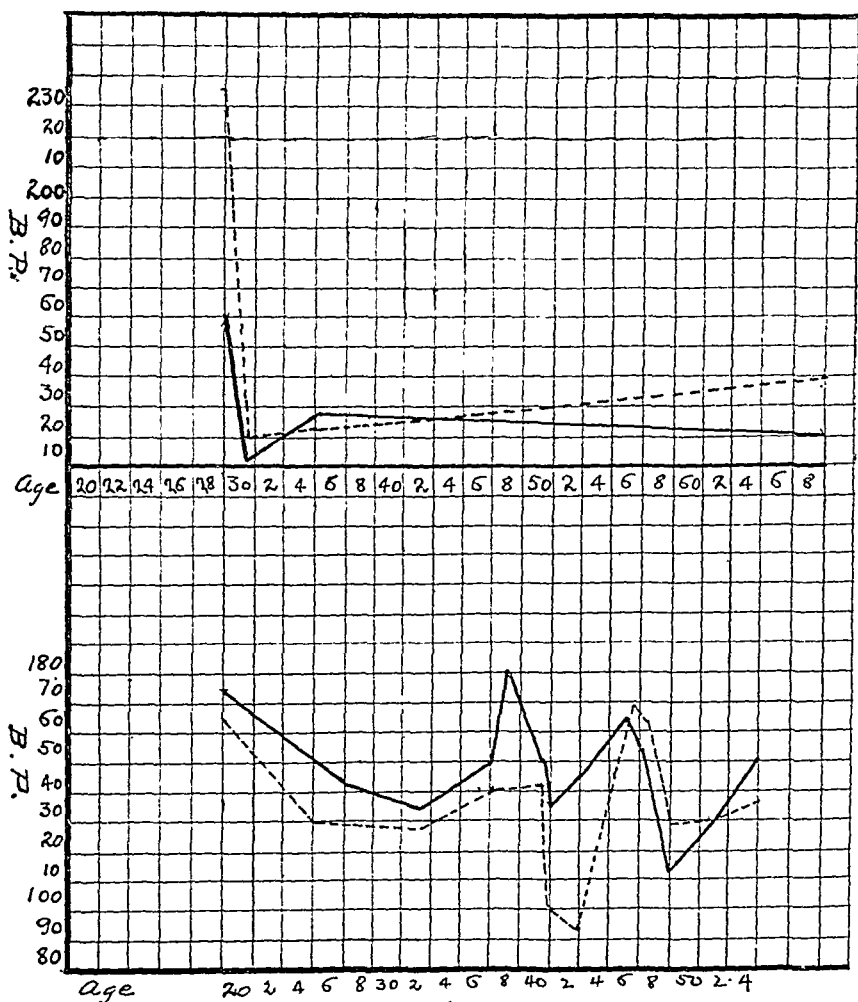


Chart V.—Showing preoperative (solid line) and postoperative (broken line) blood pressure curves in hysterectomies, the upper set in cases with one ovary conserved, the lower with double oophorectomy. Demonstrating that the effect of breaking the endocrine balance is transient.

4. That removal of the uterus and ovaries in women of forty or over, raises the pressure for a varying period, but unless there is some intercurrent disease, the woman rapidly regains her pre-operative pressure.

5. That conservation of the ovary or ovaries secures for the woman a less tumultuous operative climacteric.

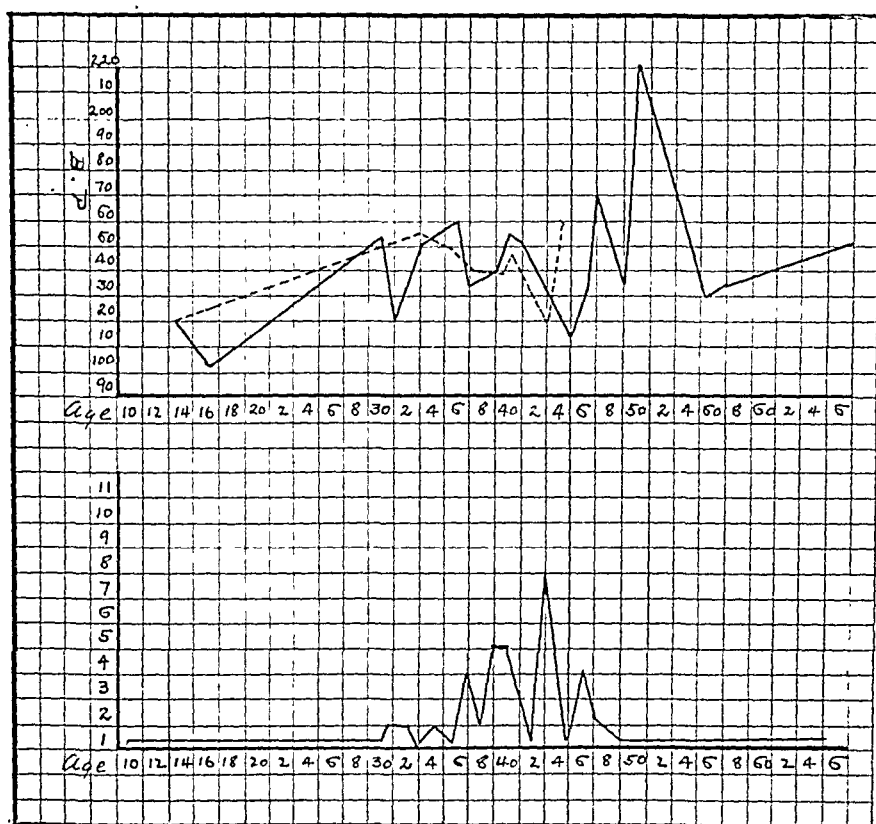


Chart VI.—In the 416 cases 14 per cent showed an albuminuria, especially common between thirty-nine and forty-six, while the greatest age in these cases with albuminuria was fifty-four.

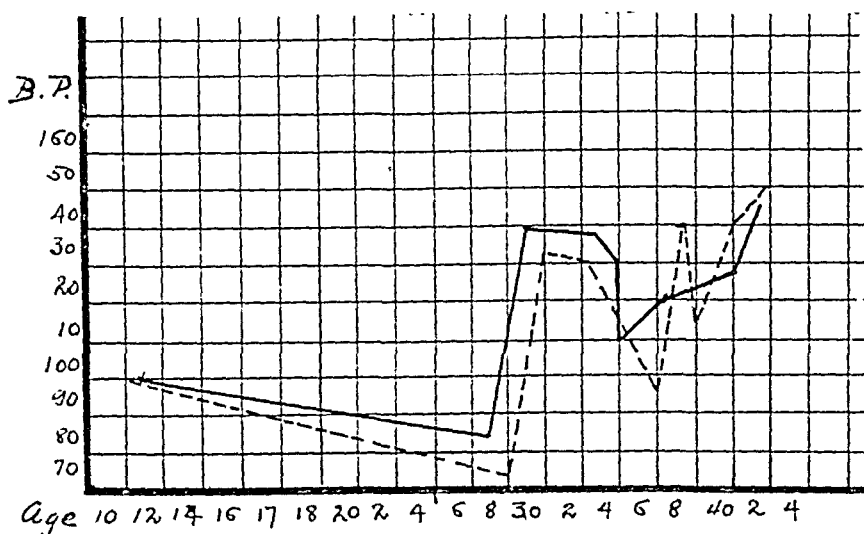


Chart VII.—Showing that the immediate effect of radium on blood pressure in fibroid cases was to produce hypertension. Solid line refers to preoperative, dotted to postoperative, observations.

6. And finally, that the pressure and nervous phenomena are more pronounced after radium than after operation.

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(For discussion, see p. 300.)

# REVIEW OF ONE HUNDRED CASES OF WOMEN WITH PELVIC TUBERCULOSIS WITH SPECIAL REFERENCE TO THE END RESULTS OF OPERATIVE TREATMENT\*

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THIS study of the end results of the operative treatment of pelvic tuberculosis was undertaken in order that the conclusions drawn therefrom might serve as a guide for the treatment of future cases. For it must be confessed that the fate or health of most of the patients operated upon during the past twenty years in the University Hospital and private clinics was unknown. In short we have been in no position to summarize the results of our own clinical experience with this disease, whereby certain definite principles of treatment for the different varieties of pelvic tuberculosis could be formulated and carried out with prospect of success.

The hundred cases used for this report have not been selected; on the contrary, each operative case since 1901, proved tuberculous by microscopic examination, has been included in the list. This insistence upon microscopic examination as a criterion, while proving that each and every case was tuberculosis, since the examinations were made in the Pathological Laboratory of the University of Michigan, necessitated the exclusion of not a few cases undoubtedly tuberculous from a clinical standpoint. However, the inclusion of such cases thought to be tuberculous by inspection and palpation would have given rise to so much doubt as to their true nature when it came to the study of end results that the present plan was adopted.

It was hoped that by persistent work through follow-up letters to patients and referring physicians, inquiries through the social service department and other agencies, the after-histories of the patients who survived the operation and left the hospital could be ascertained. Thanks to the courtesy and kindness of all concerned in this work this hope has been fulfilled, rather remarkably, since we have been able to trace and secure the postoperative histories of all but two of the 93 patients who were operated upon for various forms and degrees of pelvic tuberculosis, who survived the operations and were discharged from the clinics. This despite the fact that some of the patients were operated upon nearly twenty years ago. While in some

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\*Read at the Forty-seventh Annual Meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

cases the information has lacked in detail, on the whole the result of this follow-up work has been quite satisfactory and has placed in our possession some valuable and interesting data from which it has been possible to draw certain conclusions. While the investigation has developed interesting data connected with the various forms of pelvic tuberculosis, only the portions having to do with the end results of operative treatment will be made use of.

Since every case which microscopically showed any part of the generative tract or the peritoneum to be tuberculous was included in the series, naturally the material is varied from the ordinary inflammatory case which laboratory investigation proved to be tuberculous, to the very severe tuberculous infection diagnosticated prior to operation. Relatively few cases, however, were of the unsuspected variety, showing that the disease was fairly well advanced at the time of the operation.

#### PRIMARY MORTALITY

With the exception of four cases of colpotomy, one case of trachelorrhaphy which showed tuberculosis and a dilatation and curettage where the patient refused a second operation, the abdominal or pelvic cavity was opened during the course of the surgical treatment.

The primary mortality was 7 per cent. The operative mortality in any series of cases will depend upon the nature of the material and upon the kind of treatment employed, whether conservative or radical. Therefore the various mortality figures of different authors for the operative treatment of pelvic tuberculosis mean very little when considered by themselves. Undoubtedly Norris is right when he states in his recent admirable monograph "Gynecological and Obstetrical Tuberculosis" that the operative mortality from the operation *per se* in properly selected cases of tuberculous salpingitis is not greater than in other chronic tubal infections. However, it is practically impossible to make a selection of such cases, for usually the tuberculous infection is not confined to the tubes but involves other portions of the generative tract as well as the pelvic and abdominal peritoneum. Pelvic adhesions due to tuberculosis uniting the intestines and omentum with the uterus and appendages are entirely different from a technical standpoint from pelvic adhesions caused by other bacterial agents. Separation of tuberculous adhesions is a hazardous surgical procedure since the integrity of the gut is quite frequently impaired, necessitating, after separation of the adhesions, repair of gut injuries by suture or resection.

Again, since pelvic tuberculosis is usually a secondary infection from a focus elsewhere in the body, failure to detect or estimate the extent of the primary tuberculous lesion may result in a high primary

mortality from general and not from local causes. More and more is the pelvic surgeon averse to opening the peritoneal cavity in chronic disease where there is an elevation of temperature. Experience has shown that where this rise occurs and the pelvic inflammation be circumscribed, the infection may be a mixed one and contamination of the peritoneal cavity may be followed by fatal peritonitis. Hence it is good practice to investigate well the causes of rises of temperature and pulse in pelvic inflammatory disease before undertaking any operative procedure.

Analyzing the causes of death in the seven cases it will be seen that errors in judgment in subjecting the patients to operation and not errors in operative technic were mainly responsible for the results. In four of the cases there were distinct rises of temperature and pulse rate due to pulmonary tuberculosis as evidenced by chest findings. Five of the deaths resulted from general tuberculosis, pulmonary or acute miliary, and were merely hastened and not produced by the operations. In the light of our present knowledge, operation would have been decided against in five out of the seven cases where death resulted.

It must be remembered that the clinician of today is in a much better position than was his predecessor to determine definitely the presence and extent of pulmonary tuberculous lesions. Roentgenography has been a great aid in detecting pulmonary lesions where physical signs were doubtful and sputum examination negative. Hence it is the surgeon's duty to make the most exhaustive examination of the chest in every case of pelvic inflammatory disease, especially when the local signs are accompanied by an elevation of temperature.

#### FAMILY HISTORY OF TUBERCULOSIS AND CHEST FINDINGS;—100 CASES

As before stated the positive diagnosis of pulmonary tuberculosis has been greatly developed during the period in which this series of cases occurred. Cases undiagnosed fifteen years ago are easily recognized today. In spite of this inaccuracy there were positive chest findings of tuberculosis in 25 per cent of the 100 cases while there was a family history of tuberculosis in 22 per cent. These are important facts in any consideration of end results of operative treatment of the pelvic tuberculous process, since quite a proportion of the patients who died after leaving the hospital not only had positive chest findings at the time of operation but the reports showed they died from pulmonary and not from the pelvic lesions.

#### SECONDARY MORTALITY

There were 16 secondary deaths over a period of 18 years, as would be expected in any series of cases in women whose ages ranged from 13 to 50 and whose average age was 29.2. General paresis, carcinoma of the cervix, carcinoma of the face, uterine fibrosarcoma, peritonitis

due to a second operation, were each responsible for a death while two cases of intestinal obstruction, one following an operation for vaginal fecal fistula, and one due to a myosarcoma caused death in two instances. Of the 16 patients who died later 9 succumbed to some form of tuberculosis. In five cases, the cause of death was stated to be general tuberculosis, 9 years, 8 years, 11 months, five months and one month subsequent to the operation. In three cases pulmonary tuberculosis was given as the cause of death, a few months, 3 months and 8 years following operation.

It is interesting to note as confirmatory of what has been stated above that 7 of the 9 patients who died later of tuberculosis had positive chest findings when operated upon.

#### END RESULTS IN ADDITION TO PRIMARY AND SECONDARY MORTALITY

In all there were 23 deaths, 7 primary and 16 secondary, leaving 77 of the 100 operated patients to be accounted for. Fortunately we have been able to trace all but two of these patients. Of these 75 patients from whom reports have been received 73 are alive and in good health, while two, though alive, are in poor health.

Just as with cancer patients after operation these reports must be considered in connection with the age periods since the operations. As has been pointed out by a number of authors, just as with cancer, most of the postoperative deaths occur within two years. Perhaps our series is unique in the fact that we have been able to keep track of some of our patients over such a long period of time, nearly twenty years.

From 15 to 20 years after the operations 13 patients were living and well; from 10 to 15 years, 18 patients; from 5 to 10 years, 20 patients; and under 5 years 22 patients.

This is not an unsatisfactory showing considering the nature of the material from which the series of pelvic tuberculosis cases is made up. For instance, in the 100 cases the peritoneum was involved 60 times, omentum 20, uterus 30, right tube 67, left tube 61, right ovary 30, left ovary 25, appendix 8 and cervix 2. Ascites was present in 23 of the 100 cases.

Our figures are about the same as those given by other authors as quoted by Norris and Greenberg. Strikingly better statistics can be explained, not from more skilled surgical treatment but by better judgment in discarding cases hopeless from the extent of the primary or secondary lesions.

#### SERIES OF 44 CASES OF PELVIC TUBERCULOSIS WHERE UTERUS AND APPENDAGES WERE REMOVED

In an endeavor to arrive at some exact figures regarding the frequency with which parts of the genital tract are the seat of the

tuberculous lesion, where all tissues removed have been examined microscopically, 44 cases of hysterectomy with bilateral salpingo-oophorectomy have been grouped and studied. Obviously this is the only method by which it can be determined what organs are involved, since if they be not removed they cannot be examined microscopically. For the sake of convenience the results of this investigation have been arranged in Table I.

In explanation of the frequency with which the ovaries were found tuberculous in the series it may be said that Doctors Warthin and Weller of the Pathological Laboratory took the ground that the ovary itself was involved in perioöphoritis and did not think it advisable to speak of perioöphoritis and ööphoritis as separate conditions. Under this classification involvement of the ovary in our series, 43.1 per cent, corresponds with the higher percentages of such involvement reported by Terillon and Williams. Greenberg's percentage based upon the number of ööphorectomies, 166 in 200 cases of pelvic tuberculosis was 33.1 per cent, just exactly ten points lower than in our own series.

It will be seen that in nearly one quarter (22.7 per cent) of the 44 cases making up the series the uterus, tubes and ovaries were involved in the tuberculous process, while the tubes were involved in 86.3 per cent and the uterus in 50 per cent of the cases. These figures certainly should make us pause in regard to the advisability of leaving any portion of the internal genital tract when operating upon pelvic tuberculosis. Certainly one would hesitate to leave the uterus when it is involved in fifty per cent of the cases. It is doubtful whether any method of treatment except ablation will cure tuberculosis of the uterus and if it be not cured it is a constant menace to the patient.

The contention of Norris that the uterus should be preserved in order to interfere as little as possible with the blood supply of the ovaries which according to his classification he found involved in a small proportion of cases, 4 out of 31 cases (13 per cent), would seem hardly justifiable. Doubtless it is desirable to preserve ovarian function as long as possible but not at the risk of leaving behind such lesions as tuberculosis or cancer.

On the whole a study of the table would seem to demonstrate the superiority of radical treatment of pelvic tuberculosis. The demonstrable advantage of the radical over more conservative treatment is not so overwhelming as to entirely settle the question, yet the figures are quite convincing. The very fact that the uterus and appendages were removed in this series of 44 cases shows that macroscopically these organs were considered diseased enough to demand removal and showed that the pelvic tuberculous process was not in its incipency but was advanced. Additional proof is present in the per-

TABLE I.

SERIES OF 44 CASES PELVIC TUBERCULOSIS WITH HYSTERECTOMY AND BILATERAL  
SALPINGO-OOPHORECTOMY

INVOLVEMENT	CASES	%	PRIMARY DEATHS	SECONDARY DEATHS
Uterus, tubes, ovaries	10	22.7	1	1tbc. general 9 years 1tbc. general 5 months
Uterus, tubes	7	15.9	1	
Uterus, tubes and one ovary	1	2.2	1	
Uterus alone	4	9.0	0	1 Intestinal obstruction 1 Carcinoma cervix
Tubes and ovaries	8	18.9	0	1 tuberculous peritonitis, 5 mos.
Both tubes	13	29.9	0	1 Pulmonary tuberculosis 1 Following operation later
Uterus involved	22	50.0		
Ovaries involved	19	43.1		
Tubes involved	39	86.3		
Peritoneum	33	66.6		
Ascites present	9	20.4	1 (above)	2 (above)
Deaths	10	22.7	3	4 tbc. 3 other causes
Patients living and well	34	77.3		
Positive chest findings	14	31.8	1 (above)	3 (above)
Living and well with chest findings	10	22.7		

centage of cases of involvement of the parietal peritoneum, 33, (66 per cent) and the number of cases where ascites was noted, 9 (20.4 per cent). If more proof be needed as to severity of the tuberculous infection in the series it is shown by the preoperative chest findings, 14 or 31.8 per cent, a much higher percentage than in the entire series (25 per cent). In spite of these apparent handicaps the percentage of those living and well after the operations was distinctly higher than in the whole series of 100 cases (77.3 as compared with 73 per cent).

The radical operation for pelvic tuberculosis while giving the best end results must not be performed as a routine procedure irrespective of other factors in the case. It must be borne in mind that it is of the utmost importance to determine the extent and severity of the primary focus of the disease and to act accordingly so far as operation is concerned. In this as well as in the larger series errors in judgment led to most of the primary and quite a proportion of the secondary deaths.

In view of the findings in certain cases where for one reason or the other no organs could be removed, merely tissue for diagnosis, it is not so imperative to remove tuberculous as cancerous foci. For example, in the larger series there were 12 cases of exploratory laparotomy and biopsy. In all cases the peritoneum was involved. They were apparently desperate cases yet 50 per cent of these patients were living and well from 1 to 18 years after the exploratory operations. This would bear out the contention of those who assert that



a certain proportion of even severe forms of pelvic tuberculosis of the ascitic or fibroplastic type recover under medical treatment.

There were 23 out of 100 cases with ascites. In 6 of the cases tissue only for diagnosis was removed. Three of these patients recovered and were living and well from 3 to 18 years after operation. In 17 cases with ascites where the tuberculous foci were removed there were 4, one primary and three secondary deaths. The 13 remaining patients, 76.4 per cent, practically the same percentage as in the series of 44 cases were living and well at the last reports.

The appendix was removed in 26 cases and was reported tuberculous in 8 instances, twice the lesion being judged to be primary and 6 secondary.

Nearly all authors have commented upon the frequency of fistulae following operative procedures for pelvic tuberculosis. These fistulae involve the intestine or bladder and connect with the vagina or the surface of the abdominal wall. They arise usually from attempts to separate bowel adhesions during which the integrity of the gut is impaired. Such accidental tears of the gut in ordinary lesions due to gonorrheal infection are easily repaired and rarely fail to heal. This is not the case in pelvic or abdominal tuberculosis where fully one-third of such accidents result in fistulae.

The formation of fistulae is aided by drainage of all kinds whether abdominal or vaginal. For this reason drainage in tuberculous lesions is to be avoided whenever possible.

In the series of 100 cases there were 5 fecal fistulae, either vaginal, abdominal or both. Three of these patients died while two are alive with the fistulae still open. In one patient who entered the clinic with a vaginal fecal fistula and where the uterus and appendages were removed for far advanced tuberculosis, a permanent left inguinal colostomy was performed after a number of failures to close the fecal fistula in the upper third of the rectum.

There were two vesicovaginal fistulae following the operations in women who refused further operation. One died 8 years after the operation, of pulmonary tuberculosis, the other still retains her fistula eighteen years subsequent to operation.

#### CONCLUSIONS

1. Since pelvic tuberculosis in women is usually a secondary infection it is of the first importance to find and estimate the extent of the primary focus before deciding for or against operation for the pelvic lesion.
2. Operation should be postponed or avoided altogether when the pulmonary tuberculous lesion is extensive.
3. Otherwise the percentage of primary and secondary deaths will

be high, since the operative procedures may augment the pulmonary lesions, as shown in the series of 100 cases analyzed where over 50 per cent of the patients who died had demonstrable pulmonary tuberculous lesions.

4. The end results of the operative treatment of pelvic tuberculosis are on the whole favorable, since about 75 per cent of the patients should be alive and in good health after a considerable period of years.

5. Whenever the condition of the patient warrants, radical removal of the pelvic organs is indicated since more than one portion of the genital tract is usually involved in the tuberculous process and because the best end results follow such radical removal.

6. Unless too extensive, tuberculosis of the peritoneum will be cured if the other pelvic tuberculous lesions be removed.

*(For discussion, see p. 308.)*

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## A STUDY OF ADENOCARCINOMA OF THE FUNDUS OF THE UTERUS

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**B**Y ADENOCARCINOMA of the fundus is meant any carcinoma growing in the uterine cavity above the internal os, springing from the surface epithelium or from the gland epithelium of the fundus. There are two types of this tumor; the adenomatous, and the type with solid cords made up of cancer cells. It is probable that the latter is a later development of the adenomatous type. No distinction will be made between these two types in this paper. Mallory<sup>1</sup> states that in the fundus the tumors "may grow in solid alveolar, or gland form."

There is one other type of carcinoma occurring in the fundus of which there is probably one instance in the series of cases at the Free Hospital for Women. This is the epidermoid carcinoma. The specimen shows no carcinoma in the cervix or below the internal os, yet the picture under the microscope is that of large masses of epithelium with two or three early pearl formations. This type is rare and only one has come to our notice. It is probably due to a metaplasia from the cancer cells growing in cords to a squamous epithelium, as it sometimes takes place in carcinoma of the endocervix.<sup>2</sup>

Adenocarcinoma may develop or start in any part of the mucous membrane of the uterine cavity. It then progresses by a heaping up of the membrane until it covers the entire surface of the epithelium of the carcinomatous mass in one area, or it may spread over the mucous fundus. In the one type it forms a large mass that is located in one area only, and in the other it may spread widely, leaving no part of the epithelium intact. At an early stage the tumor shows a delicate, shaggy, finger-like process from which offshoots may occur, and the heaping-up

of these processes soon forms the rough, soft, mass so characteristic of most cases. Although in our series we have seen no very early cases, there are two cases in which the curettings have shown typical adenocarcinoma, but after removal of the uterus no carcinoma could be found. This probably means that a small growth was entirely removed with the curette.

The size of the uterus varied greatly, from 5 cm. in length to one which was 19 cm. in length. In one-fifth of the cases in this series the uterus was less than 7 cm. in length. 7 cm. to 8 cm. is the normal length of the virgin uterus.<sup>2</sup> Many of the tumors, therefore, did not cause an enlargement of the uterus. In four cases it was 5 cm. in length. These were probably atrophied uteri. One-third were of normal size and the rest 9 cm. or over. The usual appearance was that of a normal sized or enlarged uterus with a mass of soft, friable material which grew from its wall. There was usually a definite mass with a broad base, and numerous smaller areas of the same material scattered over the uterine mucosa.

This paper is based upon a study of forty-four cases of adenocarcinoma of the fundus of the uterus operated upon at the Free Hospital for Women in Brookline, Massachusetts, since 1903. In nearly all the cases records, microscopic slides, and the specimens themselves were available for study.

#### SYMPTOMS

The average age in our series of cases was fifty years, the youngest being thirty-five and the oldest sixty-eight. There were three patients from thirty to forty years old; twelve from forty to fifty; twenty from fifty to sixty; and nine from sixty to seventy. As fifty to sixty is the age generally quoted for the most usual development of this disease,<sup>2, 3, 5</sup> it is interesting to note that there were fifteen cases under that age, so that even in younger women the disease must be looked for carefully.

Thirty-seven of the forty-four patients were married and of this number thirty-three, or 75 per cent had children; so that judging from our figures, the disease is more likely to be found in women who have borne children than in those who have not. The average number of children was three. Many writers believe carcinoma of the fundus to be a disease of the nulliparous,<sup>2, 4, 6, 7</sup> but this belief is not substantiated in this series, for most of our cases had borne children. Ashton says, "the disease attacks women who have borne children and those who are sterile with about equal frequency." Fifty-five per cent had passed the menopause, the average years beyond it being eight. Forty-five per cent were still having their catamenia, thus making the diagnosis in these cases of cancer of the fundus from the history more difficult.

*Menstrual History.*—When this tumor occurred before the menopause the first symptoms were those of menorrhagia or metrorrhagia. It was

usually noticed that there was a prolonged flow, sometimes approximating a real hemorrhage, with or without clots. Other cases had a small amount of bleeding between periods with a large amount of flow at the time of catamenia. Later a discharge was usually noticed.

*Discharge.*—This usually occurred before the bleeding in cases after the menopause, and after the bleeding in cases before the menopause. At first the discharge was thin and watery, due to the normal excretion from the epithelium and the thin-walled vessels of the tumor.<sup>3</sup> But it soon became foul, irritating, and blood-tinged, because of the presence of infection, or necrosis of the tumor mass. It was occasionally blood-tinged on account of the proximity to the surface of the fine vessels in the tumor.

*Bleeding.*—Bleeding in cases past the menopause, and one of the causes of it in cases before the menopause, is due to necrosis, infection and sloughing of the tumor mass. This may give rise to startling hemorrhages or it may be just a show of blood lasting but a few days. Bleeding is sometimes definitely related to overexertion and straining.<sup>3</sup>

*Pain.*—Pain was not a constant symptom, and a feeling of pressure and discomfort in the pelvis was much more frequent. In cases of long duration there may be pain in the back and legs due to pressure on the sacral plexus.<sup>3</sup>

*Anemia.*—In some cases there was a marked secondary anemia, especially in those in which there had been a great amount of bleeding. Also, in the very advanced cases when the tumor was of large size, there was an anemia even without the presence of severe hemorrhages.

*Cachexia.*—Cachexia was not generally noted in these cases of cancer of the fundus, although in some of the advanced cases with metastases it was marked.

*Loss of Weight.*—Loss of weight occurred in but eight of our forty-four cases, while seven were gaining weight. Loss of weight usually occurred in the cases showing a severe anemia and large growths.

The average duration of symptoms was one year and eight months, the shortest being six weeks and the longest ten years. This makes it quite apparent, considering the statistics given below, that if the cases were operated upon as soon as the symptoms presented themselves, the percentage of cures would be nearly perfect. The symptoms are present early in the disease and are very evident, but because of the fact that they appear about the time of the menopause they are frequently overlooked, and are attributed to that very change of life. Any patient with abnormal bleeding or discharge at that period of life, even if no other symptoms are present and if a thorough physical examination is negative, should be submitted to an intra-uterine examination at once to determine the presence or absence of adeno-carcinoma of the fundus. Because of its slow growth and late metastasis, this is one of the most

favorable types of carcinoma with which to deal. Therefore, if an intra-uterine examination is made early and the curettings examined, it should be one type of cancer easy to control. Kelly and Noble<sup>8, 11</sup> state that, "Carcinoma of the body of the uterus is the most favorable of all forms of carcinoma of the reproductive organs."

#### DIAGNOSIS

The diagnosis of the disease from the history, symptoms, and examination is not easy, as is evident from the statistics given below. But supported by microscopic sections it becomes comparatively easy in nearly all cases.

In our series of cases, ten, or 22 per cent, were diagnosed before operation as carcinoma of the fundus. The rest were diagnosed as follows:

Flowing (dilatation and curettage for diagnosis)	18
Leiomyoma	12
Carcinoma of the cervix	2
Retroversion	1
Atresia of the cervix	1

The diagnosis: "flowing; dilatation and curettage for diagnosis," means that the cases presented symptoms that necessitated an intra-uterine examination because of the suspicion of carcinoma. The diagnosis of carcinoma of the fundus was considered in many cases along with the other diagnoses. The patients were submitted to a dilatation and curettage; the curettings were examined, and a hysterectomy performed after a positive diagnosis was made.

In the cases diagnosed as fibroids, a dilatation and curettage was done. In some cases with fibroids the curettings were so suggestive that the patient was sent from the operating room to wait for a microscopic diagnosis. In others a hysterectomy was performed for fibroids and the cancer not discovered until the specimen was examined in the laboratory.

The confusion of these cases with those of cancer of the cervix is not so great as would be expected, only two cases being diagnosed as such. In both of these a dilatation and curettage was done, and a hysterectomy performed at a later date.

In the retroversion case there had been menorrhagia without a foul discharge, and the bleeding was thought to be due to a congested uterus or a gland hypertrophy of the endometrium. However, upon curetting the patient it was evident that there was some further cause for the bleeding, and a hysterectomy was performed after the microscopic sections showed adenocarcinoma of the fundus.

The case of atresia of the cervix is the only one diagnosed as such, and proving itself to be carcinoma on further examination. But there are numerous cases diagnosed as carcinoma of the cervix or fundus that have turned out to be simple atresia of the cervix. This is true of

patients past the menopause who have an occasional discharge of foul material often tinged with blood arousing suspicion, which upon ether examination is found to be an atresia of the cervix. The damming back of secretions in the uterine cavity favors infection, and a chemical change in them. This discharge may cause a senile vaginitis and this in turn may give rise to small hemorrhages presenting the symptoms of carcinoma.<sup>2</sup> Often from the uterine cavity itself old blood escapes periodically in these cases. The symptoms therefore are very similar to carcinoma and great care must be taken to make a correct diagnosis.

There are many other diseases that are easily confused with carcinoma of the fundus. The more common of these are: Polyps of the endometrium and cervix; gland hypertrophy of the endometrium; menorrhagia at the menopause, probably due to overactivity of the ovary or uterine insufficiency; interstitial endometritis; diffuse adenomyoma; sarcoma; tuberculosis, etc. These can be properly ruled out by an intrauterine examination with microscopic sections.

#### PROGNOSIS

The prognosis in cases of carcinoma of the fundus is usually good. Figures given are between 53 per cent and 80 per cent without recurrence,<sup>2, 3, 5, 9</sup> and in our series there are 62.5 per cent of patients with no recurrent symptoms or physical signs five years or more after operation. There were three postoperative deaths in forty-four cases, or a 7 per cent postoperative mortality.

Of the deaths one was due to general peritonitis following a complete hysterectomy; one was due to pulmonary embolus following complete hysterectomy; and the last was due to exhaustion in an inoperable case that was a most unfavorable risk. Two cases were found to be inoperable because of extensive metastasis in the abdomen, including the ovaries, tubes, omentum, round ligaments, and abdominal wall. One patient died. The other was given radium. One year later she still had a hard mass in the pelvis, but we have no recent data concerning her condition.

Thirty-three out of forty-four cases have been traced and have either written about themselves, seen their local doctors, or been examined at the hospital. Two cases will not be considered because one patient died of an unknown cause four years after operation and the other patient had an inoperable tumor. Of these thirty-one cases, then, twenty-one, or 67.7 per cent are living and well. There were ten, or 32.2 per cent recurrences. Six of the cases with recurrence are dead. Of the cases operated upon five years or more ago sixteen could be traced, ten or 62.5 per cent are living and well with no recurrent symptoms or physical signs and 37.5 per cent had a recurrence of the carcinoma. The recurrent cases are described below:

CASE 1.—No. 3295, Mrs. C. B., married; no children. For the past six months has had excessive flowing at periods and indefinite pelvic pain. A complete hysterectomy was done December 14, 1911. On February 1, 1913, a letter from the Massachusetts General Hospital states there is a recurrence in the pelvis and the patient is having constant pain and distress in the left leg. Death was reported in August, 1913.

CASE 2.—No. 3311, Mrs. M. B., aged forty-two; two children; two miscarriages. For ten years has had irregular periods. Pain in the back and a "dragging down" feeling. A complete hysterectomy was done December 28, 1911. During the operation on manipulating the uterus the neoplasm broke through into the peritoneum on the right side. On September 4, 1913, a recurrence was noted in the bladder.

CASE 3.—No. 3724, Mrs. M. D., four children. For ten years has been flowing a small amount every day and occasionally passing clots. On October 15, 1912, a complete hysterectomy was done. At operation the patient was found to have a large, malignant papillary cyst of the left ovary. This cyst was ruptured at operation. On March 26, 1915, a lump was noticed in the abdominal scar. This was excised April 5, 1915, and microscopically proved to be adenocarcinoma of uterine type. At operation the omentum was found to be infiltrated with cancer. On August 10, 1916, another recurrence was removed from the abdominal wall.

CASE 4.—No. 4505, Mrs. L. D., age sixty-three; seven children and one miscarriage. Has had a bloody discharge and pain in the left side for nine months. On November 11, 1913, a supra-vaginal hysterectomy was done. On November 14, 1914, her doctor telephoned that there was a recurrence in the cervix.

CASE 5.—No. 6416, Mrs. J. G., age fifty-four; two children and one miscarriage. Has had a bloody discharge for one year which has increased in amount the past six months. Sometimes has a dull ache in the right side and is losing weight. On July 18, 1916, a complete hysterectomy was done. An extensive recurrence in the bladder was noted March 13, 1917. Patient has since died.

CASE 6.—No. 6549, Mrs. F. D., age sixty-two; two children. For one year has had a slight flow every three or four days. Has a watery discharge which is occasionally blood-tinged. On October 12, 1916, a complete hysterectomy was done. August 29, 1919, a recurrence was found in the bladder, and three months later a mass was found in the pelvis. On October 24, 1921, examination showed a mass in the lower abdomen apparently attached to the ilium on the left and extending to the umbilicus.

CASE 7.—No. 8593, Mrs. A. M., age sixty-four; two children. For three years has been flowing in small amounts and has had an intermittent bloody vaginal discharge. Patient had a severe diabetes and was considered a poor operative risk, so that on August 6, 1919, she was given 100 mg. of radium in a rubber catheter in the uterine canal for twenty-four hours. On October 29, 1919, another radium treatment was given at the Huntington Memorial Hospital, Boston, and in June, 1920, she died at the Huntington Hospital of recurrent carcinoma.

CASE 8.—No. 8597, Mrs. J. F., age fifty; two children. For five months has been flowing every day. Has a vaginal discharge with a very bad odor. On August 14, 1919, a supravaginal hysterectomy was done. The disease was found to extend through the right cornua of the uterus. On May 12, 1920, an operation for postoperative hernia was performed and at this time the omentum was found

to be studded with carcinoma, there were nodules on the pelvic peritoneum, and the iliac glands were enlarged. On November 22, 1920, an examination revealed a negative pelvis but a tumor was found in the epigastrium. The patient had definite gastric symptoms. It was thought to be a probable metastasis in the stomach. She died in April, 1921.

CASE 9.—No. 8677, Mrs. M. H., age forty-one; no children. For the past eight months has been flowing most of the time. Has some pain in the pelvis. Is losing weight. On October 6, 1919, a supravaginal hysterectomy was done. At operation the right ovary was enlarged and cystic and was filled with a soft, friable mass of carcinoma. On November 12, 1919, patient died of extensive abdominal metastases.

CASE 10.—No. 8687, Mrs. B. D., age fifty-two; six children. For two years has had flowing and a purulent discharge. Lately the flowing has become excessive. On October 21, 1919, a supravaginal hysterectomy was done. On January 11, 1920, the patient died at the Peter Bent Brigham Hospital of metastatic carcinoma of the spine.

#### FREQUENCY

The cases in this series are ones that have a complete hospital and laboratory record occurring during the years 1903 to 1921, a period of eighteen years. Their frequency in an institution limiting itself to gynecology is interesting. The number is surprisingly small and the cases have increased two per year in the last eight years over the previous ten years.

The following table shows the number of cases per year since 1903.

1903	2	1914	4
1906	1	1915	3
1907	1	1916	4
1909	2	1917	3
1910	1	1918	3
1911	3	1919	7
1912	1	1920	2
1913	3	1921	4
Total			44

The favorable cases are reported below:

No. 302, Miss M. K., age forty-nine; single. Flowing for two years with excessive clots. Supravaginal hysterectomy October, 1903. Reported in good condition October, 1921.

No. 2007, Mrs. H. C., age thirty-five; one child. Flowing for two years. Has a foul watery discharge. Complete hysterectomy, February, 1909. Reported in good condition, October, 1921.

No. 2211, Mrs. J. B., age fifty; three children. Vaginal discharge. Complete hysterectomy October, 1909. Reported in good condition July 20, 1914. Has since moved away.

No. 3339, Mrs. M. B., age thirty-nine; four children. Flowing for six months. Supravaginal hysterectomy, December, 1911. Reported in good condition, October, 1921.



No. 4249, Mrs. E. F., age sixty-eight; one child. Flowing for two years. Supravaginal hysterectomy (both tubes and ovaries left) May 28, 1913. In October, 1921, was reported to be in good condition physically but mentally unbalanced.

No. 4909, Mrs. A. C., age fifty-six; one child. Flowing for four years. Complete hysterectomy, May, 1914. Reported in good condition, October 1921.

No. 5733, Mrs. A. C., age sixty-five; three children. Irregular flowing for three years with a thick, bloody discharge. Complete hysterectomy, July, 1915. In good condition but complains of sciatica, October, 1921.

No. 5906, Mrs. G. C., age sixty-two; two children. Flowing for three years. Complete hysterectomy, November, 1915. Reported in good condition, October, 1921.

No. 5937, Mrs. K. K., age fifty-four; six children. Flowing for one and one-half years. Supravaginal hysterectomy with coning out cervix, November, 1915. Condition good at examination, March, 1916.

No. 6170, Miss E. S., single. Flowing for two years. Supravaginal hysterectomy, March, 1916. At operation a metastasis was found in the left ovary. Patient's condition good on examination, February, 1920.

No. 6886, Mrs. L. D. C., age fifty-four; five children. Has a hemorrhage each month with bloody discharge in between. Supravaginal hysterectomy, April, 1917. Patient's condition good on examination, October 20, 1921. Metastasis in the right ovary noted at operation.

No. 7095, Mrs. G. B., age forty-one; nine children. Flowing with pain in the abdomen and legs. Complete hysterectomy in July, 1917. Vesicovaginal fistula operated upon and cured. Reports that she is in good condition in October, 1921.

No. 7706, Mrs. A. H., age fifty-eight; one child. Bleeding and watery discharge. Pain in the left side. Supravaginal hysterectomy with coning out cervix, May, 1918. Reports in October, 1921, that she is in good condition.

No. 7856, Mrs. H. W., age fifty-three; three children. Continuous flowing for two years, profuse for one year. Complete hysterectomy, July, 1918. Examination: January 30, 1919, negative.

No. 8750, Mrs. E. P., age fifty-five; no children. Has a bloody discharge every day. Complete hysterectomy, October, 1919. Examination, October, 1921, negative.

No. 8759, see radium cases below.

No. 9054, Mrs. D. O'N., age forty-one; four children. Flowing for last two months. Complete hysterectomy, April 19, 1920. Reports herself in good condition October, 1921.

No. 9376, see radium cases below.

No. 9550, see radium cases below.

No. 9558, Mrs. A. A., age fifty-seven; no children. Had a hemorrhage in December, 1919. Has a dark discharge with a bad odor. Supravaginal hysterectomy with coning out of cervix, February, 1921. Reports that her condition is fair in October, 1921.

No. 9716, Mrs. M. L., age fifty; five children. Watery discharge for six months. Complete hysterectomy, April, 1921. Reports in October, 1921, that her condition is good.

The table on page 249 gives the number of years the patients have survived operation.

18 years postoperative	1
12 years postoperative	1
10 years postoperative	1
8 years postoperative	1
7 years postoperative	1
6 years postoperative	2
5 years postoperative	1
4 years postoperative	3
3 years postoperative	2
2 years postoperative	2
1 year postoperative	2
Under one year postoperative	4

One case had a metastatic growth in the left ovary and was alive and well four years after the operation. Another had a metastatic growth in the right ovary and was well three years and six months after operation.

The percentage of adenocarcinoma of the fundus compared to the total number of cases operated upon in the hospital during the same period of years was 0.47 per cent of the total. The number of cases operated upon was 9,566, and the number of cases of adenocarcinoma of the fundus was 44. There were 350 cases of carcinoma of the cervix, or 3.6 per cent of the total number of cases operated upon. In hospital practice, at least among patients coming from the working classes, the percentage of adenocarcinoma of the fundus seems to be very much less than the percentage of carcinoma of the cervix. There were 7.9 times as many cases of carcinoma of the cervix as adenocarcinoma of the fundus. On the contrary in private practice there undoubtedly are more cases of adenocarcinoma of the fundus than of carcinoma of the cervix.

*Operations.*—The types of operations performed in this series of cases are as follows: (Hysterectomy of any type includes bilateral salpingo-oöphorectomy).

Complete hysterectomy (not Wertheim's Method)	21
Supravaginal hysterectomy	14
Supravaginal hysterectomy, coning out of cervix	3
Radium	4
Inoperable (exploratory laparotomy)	2

One of the exploratory laparotomy cases was given radium as a palliative procedure.

The percentage of recurrence in these two main types of hysterectomies is about equal, the complete having 23.7 per cent of recurrences and the supravaginal 28.5. Supravaginal hysterectomy with coning out the cervix had no recurrences, but only three operations of this type were performed. Of the radium cases (not including the inop-

erable case) there was one recurrence and one probable recurrence, two being free from cancer at the present writing.

The above statistics leave but little to choose between the three types of hysterectomies. But because of the possibility of recurrence in the cervical stump, of which we have one case, and because of the frequent proximity of the carcinomatous tissue to the cervix, the complete hysterectomy (not Wertheim's method) is the operation of choice. The Wertheim operation is not necessary because the parametrial glands and the iliac glands are not likely to be involved in this type of carcinoma, as the lymph channels from the fundus do not drain to these glands.<sup>10</sup>

Of the postoperative deaths two followed complete hysterectomy, and one followed an exploratory laparotomy. Undoubtedly the danger is greater in the complete hysterectomy, but because of the danger of the tumor being very close to the cervix and the possibility of a recurrence in the stump, it is better to do a complete operation.

The two inoperable cases easily explain themselves, as there were metastatic growths in the omentum, round ligaments, abdominal wall, tubes, and ovaries, and it was impossible to remove all the growth. The radium cases were as follows:

CASE 1.—No. 8075, Mrs. J. C., age fifty-six; no children. For eight months has had a feeling of "fullness" in the pelvis followed by a discharge of bright red blood. On December 3, 1918, the patient was operated upon and on opening the abdomen a thick, white, hard membrane was found that had grown over the fundus of the uterus, and had metastasized into the round ligaments, tubes, ovaries, and about the ureters. One hundred mg. of radium in a catheter were placed in the uterine cavity for fourteen hours. On January 30, 1919, less thickening was noticed in the parametrium than previously. On August 2, 1919, the pelvis was filled with a hard mass.

CASE 2.—No. 8593, see report of recurrent cases.

CASE 3.—No. 8759 Mrs. E. M., age forty-nine; one child. For a year and a half has had hemorrhage and metrorrhagia of variable intensity. At times there is a watery, bloody discharge. She complained of blurred vision, and dizzy spells, and on physical examination a systolic murmur loudest over the aortic area was noted. On November 13, 1919, 100 mg. of radium in a catheter were placed in the uterine cavity for twelve hours. In November, 1921, patient was found to be free from evidence of carcinoma. At operation the diagnosis of carcinoma was not made, and radium was given for multiple fibroids.

CASE 4.—No. 9376, Miss A. H., age forty-five; single. Has had increasing menorrhagia and dysmenorrhea for past five years. Physical examination revealed a short, harsh, systolic murmur. Carcinoma was not suspected at operation on December 2, 1920, and 50 mg. of radium in a catheter were placed in the uterine cavity for twelve hours. Examination, December 15, 1921, finds that patient has had two normal menstrual periods and has no signs of recurrence.

CASE 5.—No. 9550, Mrs. C. McP., age fifty-three; one child. Has had irregular flowing for past two years. Complains of cramps in both legs. On March 1, 1921,

patient was given 100 mg. of radium in a catheter in the uterine cavity for twenty-four hours. On April 24, 1921 was given another dose of 100 mg. for four hours. The curettings at this time showed normal epithelium. On October 27, 1921, induration was felt in the left side extending forward to the median line, apparently in the broad ligament. No positive diagnosis of recurrent carcinoma made.

Of these five cases that were treated with radium three were not diagnosed at the time of operation, and it was felt when the diagnosis was known that the radium would be sufficient treatment. One of the five cases has signs of a probable recurrence by pelvic examination, and another died of carcinoma ten months after the first radium treatment. Two others are free from symptoms two years and one year respectively after the application of the radium. The other case had radium simply as a palliative.

Although radium is not often used at the hospital for adenocarcinoma of the fundus because operative measures are so successful, it is considered a very valuable asset in cases that are inoperable. There are two factors against the use of radium in these cases. One is that operating is a much surer method at the present time. The other is that radium is dangerous in this type of case because we cannot tell how far into the uterine wall the cancer has grown. Should the tumor have grown through the wall there is danger of causing the cancer to slough and make a hole into the peritoneal cavity. This would probably cause a fatal peritonitis.

#### COMPLICATIONS

But one operative complication was found in all the cases. This was a vesico-vaginal fistula that was operated upon later and cured.

#### PATHOLOGY

The size of the uterus in these cases varies from normal or smaller than normal to over 19 centimeters in length, and 15 centimeters in thickness. The question of cure or metastasis does not depend entirely upon the size of the uterus, for in some of the largest uteri there was but slight growth into the walls, whereas in some of the smallest there was deep penetration. The tumor grew either as a concentrated mass with a broad base, or it grew over the entire mucous membrane. The former was usually the type which penetrated the wall first and deepest, but there were cases where the other type had done the same thing. In the type with the heaped up growth and the broad base, the tumor sometimes grew to 5 cm. in diameter, or was very small, but the latter cases were not the usual ones. One of our later cases had a thin covering of peritoneum over a solid mass of cancer with no sign of muscle wall or endometrium. Yet in this case there was no extension to the cervix, the growth ending at the internal os. Also the peritoneum was not broken through, although

the tumor extended to it in every direction. This was probably a very late stage of the diffuse mucous membrane type of growth, for the tumor was of the same thickness throughout. The tumor may be polypoid in form but only three of this type were found. In this series it was not so common as were the other types.

*Location of the Tumor.*—The most usual situation for the tumor was in the top of the uterus or on the posterior wall. The greater number of growths were situated in these locations. Tumors were found on the anterior wall in eight out of thirty-nine cases; in the right cornua in four, and three were of the polypoid type. This is interesting to note, for in doing a dilatation and curettage the posterior wall and top of the uterus must be most carefully explored. The cornua must also not be overlooked.

*Invasion of the Wall of the Uterus.*—In twenty-six out of thirty-nine cases, or in 66 per cent, there was marked invasion of the wall. That is, the tumor had begun to invade the uterine musculature as well as grow toward the uterine cavity. In only five, or in 12 per cent, had it broken through the wall into the peritoneal cavity. In one of these cases there was a growth in the ovary, but the ovary was not involved by a process of direct extension. In all cases with metastasis the tumor had involved the uterine musculature but only in one case had it broken through the peritoneum. In 33 per cent of the cases there was no marked penetration of the wall, the tumor having grown toward the uterine cavity. Mallory<sup>1</sup> says that it "may be localized in a small area and yet extend through the entire muscle wall. More often it quickly infiltrates and destroys the lining mucous membrane and invades the muscle wall more slowly."

*Lymph Channels.*—According to Poirier<sup>10</sup> there are three main channels of lymph drainage from the fundus. One of them leads from the fundus to the cervix; another runs in the broad ligament between the tube and ovary to the lumbar lymph glands; and the third from the uterine cornua along the round ligaments to the inguinal lymph glands. Before considering the metastases, it is interesting to note these three main lymph outlets to neighboring structures.

*Metastases in the Parametrium.*—The only cancer found in the parametrium was the result of direct extension. In no case was there found any carcinomatous involvement of lymph glands in the pelvis. Thus, as there are no lymph channels from the fundus to the pelvic lymph glands, and no metastatic growths found here, it seems probable that the Wertheim method of complete hysterectomy is not necessary in carcinoma of the fundus.

In one case of recurrence there was found to be adenocarcinoma of the body type in the cervical stump. There are lymph channels from the fundus to the cervix, and it is quite possible that this recurrence is due to the fact that supravaginal hysterectomy was done in-

stead of a complete hysterectomy. This helps to establish that complete hysterectomy is a better procedure than supravaginal.

*Metastasis to the Tube and Ovary.*—In all cases but one when a hysterectomy was done, the tubes and ovaries were removed with the uterus. This is a most essential procedure because, by leaving a tube or an ovary, a very possible focus for recurrence is left. In our series of cases five, or 11.3 per cent, were found on examination in the laboratory to have the tumor in the tubes or ovaries. Ashton<sup>5</sup> states that "secondary infection by metastasis is frequent in the vagina, and also in the ovaries and oviducts." Graves<sup>2</sup> states that "occasionally cancer of the body metastasizes to the tube and ovary in a comparatively early stage of its growth." Cullen<sup>3</sup> reports no cases of metastasis in the tubes or ovaries in his cases, but notes cases reported by Löhlein, Wehmer and Reichel. One case showed carcinoma in both tubes and ovaries; three cases showed carcinoma in the right ovary; and one case showed carcinoma in the left ovary. In addition to these cases, but not figured in the percentage above, one case had unmistakable cancer in the right ovary and tube. This case was considered inoperable because of wide extension. A microscopic examination was not made, and therefore it cannot be considered in the percentages. A condensed pathological report follows below:

1. 220-4383. Uterus slightly enlarged. Ovaries enlarged to size of small eggs. Both show carcinoma similar to the carcinoma found in the uterus. Both tubes are somewhat enlarged and spread over the ovarian masses. Both show adenocarcinoma on examination. This case could not be traced.

2. 6170-10149. Supravaginal hysterectomy. Uterus measures 7x9x6 cm. The left ovary measures 7x6 cm. This tumor mass contains foul, necrotic material and is a mass of papillary growth. Shows typical adenocarcinoma. Patient well four years after operation.

3. 6645-10653. Uterus measures 7x7x5 cm. Right ovary is a mass measuring 11x8 cm. Shows a papillary formation typical of cancer. Microscopic picture is that of adenocarcinoma similar to that of cancer of the fundus. This case could not be traced.

4. 8677-12598. Growth in uterus extends through peritoneum. The right ovary measures 10x7 cm. It is a multilocular cyst containing masses of soft, friable tissue. Microscopic examination shows typical adenocarcinoma. Patient died one month after operation.

5. 6886-10935. The uterine walls are thick and infiltrated with friable tissue. The right ovary is large and is occupied by a growth which is apparently adenocarcinoma. Microscopic picture shows adenocarcinoma in the right ovary. No recurrence noted three years and six months after operation.

It is interesting here to note a private case operated upon by Dr. William P. Graves, the specimen of which was brought to the hospital for examination.

9301. Uterus slightly enlarged. Right ovary is a mass 6x5 cm. Left ovary is described as senile. On microscopic examination both tubes and ovaries show adenocarcinoma similar to the cancer found in the fundus.

The sections taken at the tubal isthmuses are negative, showing that the carcinoma in the tube is not there by direct extension but a definite new metastatic growth, probably via one of the lymph channels described above. The left ovary is interesting. Before section it is described as senile, and on section in the gross it appears negative, yet in the microscopic slide areas of carcinoma are found.

This demonstrates that early metastatic processes may be easily overlooked. We cannot be sure that there is no cancer in the ovaries until they have been cut and stained and studied under the microscope. Thus, judging from this series of cases, it seems wise in performing a hysterectomy for carcinoma of the fundus to remove both tubes and ovaries.

There is the objection that the cancer in the ovaries may be a primary cancer and not a metastatic process. This objection is met by saying that the metastases reported resembled adenocarcinoma of the fundus. The tubal metastases reported appeared the same. The ovaries, both macroscopically and histologically, did not suggest primary carcinoma of the ovary. Also the histologic picture is not that of malignant papillary cystadenoma either of the type with cuboidal epithelium or the type with pseudomucinous epithelium. There is no doubt that these cases are cases of metastatic growth in the ovaries, and tubes, secondary to adenocarcinoma of the fundus. Other metastases have been found as reported in the cases of recurrence, namely, the omentum, round ligaments, the abdominal wall, the spine, the bladder, and possibly the stomach.

*Accompanying Pathology.*—Fourteen and three-tenths per cent of the cases contained fibroids which were mostly multiple or intramural. Ballerini<sup>11</sup> gives 19 per cent for his series. Ewing<sup>12</sup> feels that fibroids may be responsible for some cases. Leiomyomata did not seem to play a very great part in the development of these carcinomata, as in no specimen was the tumor growing directly over a fibroid. The pre-operative diagnosis of fibroids was made twelve times, or in 26 per cent of the cases.

In one case there was an accompanying fibroma of the right ovary.

There was one pyometra. An infected carcinoma with a tight cervix caused the uterus to be distended with pus.

In many of the cases there were definite adhesions about the tubes and ovaries, showing histologically an old inflammatory process.

#### HISTOLOGY

In the adenomatous type there are found masses of glands growing irregularly with no order and no direction. The glands are unlike the irregular ones found in gland hypertrophy of the endometrium. The nuclei are large and sometimes stain deeply, and sometimes lightly, and the cells are not typical of those of normal endometrium,

being heaped upon one another, and more cuboidal in shape. There is a marked tendency to mitosis. Often in the center of the gland will be found a small amount of cellular débris. The stroma is thin and loose, yet in other places there is a much greater amount of stroma than of adenomatous structure. There is not a regular arrangement of glands and stroma such as is found in gland hypertrophy of the endometrium. The carcinomatous glands give the impression of growth and invasion. In practically all cases there is no regular dividing line between endometrium and muscle for the glands have usually invaded the muscle microscopically and made the dividing line irregular. Frequently there is found a small solid area of carcinoma, perhaps a beginning of a cord or alveolar arrangement.

In the solid type of this tumor there are carcinomatous cells growing in solid cords or masses with a small amount of stroma. In this type there is usually a dipping into the uterine muscle, but this is not always constant, as some cases show the cancer in the endometrium and not at all in the muscle layer. The nuclei are large and stain irregularly, and there are various types of nuclear figures and mitoses.

The distinction between the adenomatous type of carcinoma of the fundus and gland hypertrophy of the endometrium in microscopic slides of curettings is sometimes difficult. It is not as difficult if the section is taken through the uterine wall and endometrium. In gland hypertrophy there is a regular irregularity, and there is present in nearly all cases the wavy appearance of a gland whose cells have increased in size, making the gland too small to contain them except by bending and stretching and humping up into the lumen. This type of gland is not found in carcinoma. Also in gland hypertrophy, gland dilatation or hyperplasia is frequently present; that is, the number of cells in the gland have increased, and to make room for them the gland has stretched and the cells have become smaller. The presence of mitotic figures is not distinctive enough to differentiate, for they occur sometimes in great numbers in gland hypertrophy. Because of the hypertrophy and hyperplasia the amount of stroma between the glands may be small in gland hypertrophy, and thus this cannot be a deciding factor. It is necessary to regard the cells of the glands themselves. The cancer cells have large, usually round, nuclei that take either a very light or a very deep stain. Large, oval, or almost round, with four or five in a layer, the gland hypertrophy cell is more regular and orderly; the nuclei smaller, usually not rounded, the nuclear stain of normal density. The distinction, therefore, is sometimes difficult, and it is necessary to take all the factors into consideration.

In other conditions that are confused clinically with adenocarcinoma of the fundus, the pathological differential diagnosis is not very confusing if the sections being studied are properly made.



## CONCLUSIONS

1. The uterus was enlarged in many cases but this was not a constant finding.

2. The average age of the patients was fifty years.

3. Seventy-five per cent of the patients had had children, the average number of children being three.

4. The average duration of symptoms was one year and eight months. Therefore we believe if more stress were laid upon irregular bleeding there would be more successful cases.

5. Judging from our statistics the diagnosis of adenocarcinoma of the fundus is not easy without microscopic study.

6. Atresia of the cervix may easily be confused with adenocarcinoma of the fundus.

7. There are 62.5 per cent of our cases without recurrence to date, five years or more after operation.

8. There were fourteen cases from 1903-1913, the first ten years, and thirty from 1914-1921, the last eight years, which is an increase of two cases a year.

9. Adenocarcinoma of the fundus is not a common tumor in hospital practice, there being but forty-four cases out of nine thousand five hundred and sixty-six operated upon since 1903, but in private practice it is undoubtedly much more common, being more frequent than carcinoma of the cervix.

10. Complete hysterectomy (not Wertheim's method) assures most success.

11. Operation rather than radium is the method of choice.

12. Five patients out of forty-four had metastatic growths in the adnexa. Therefore we believe that bilateral salpingo-oöphorectomy should always be performed along with the removal of the uterus.

13. The differential diagnosis microscopically from gland hypertrophy is sometimes difficult.

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## OUTLINING THE SUPERIOR STRAIT OF THE PELVIS BY MEANS OF THE X-RAY\*

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WHEN one considers the great advances that have been made in roentgenology, particularly in the field of osteology, it is quite surprising that no simple and accurate method for outlining the inlet of the female pelvis has been devised.

It is true that some idea of the shape of this bony ring may be obtained by the roentgen ray but the size is erroneous and from the malformed and enlarged image that ordinarily results no accurate data may be obtained.

The chief causes of the distortion thus produced are first the divergence of the rays from the target and secondly the distance of the part to be measured or photographed above the sensitive plate.

As early as 1897, Budin and Varnier<sup>1</sup> published attempts to determine the shape and size of the pelvis by this means and from that time until the present numerous investigators have labored upon the problem with varying results. An excellent review of the literature up to 1914 is given by H. Martius.<sup>2</sup>

While no attempt is made at this time to review completely the recent contributions, still it is worth while to mention briefly some of the more important ones. Van Allen<sup>3</sup> in 1916 by exposing five successive plates with the patient in the semirecumbent position used the law of similar triangles and worked out mathematically the relationship of the various points of the pelvis to each other.

MacKenzie,<sup>4</sup> in 1918, described a comparative method in which a standard plate was made from a normal pelvis and by radiographing the subject to be measured in the same position as that of the "standard pelvis" having the points of focus the same, the tube at the same angle and same distance from the sensitive plate a comparison of both plates was obtained and the internal measurements mathematically worked out.

Haret and Grunkraut<sup>5</sup>, in 1920, described a method of outlining the superior strait briefly as follows:—the subject is placed upon the radioscopic table with the target underneath and the screen above. Parallelism is obtained by superimposing lead marks which had been previously placed on the body at the umbilicus and second segment of the

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coccyx, the two extremities of the axis of the pelvis. The target is moved in such a manner under the circle of the superior strait as to eliminate divergence and an orthopelvigram obtained upon the screen which is outlined with a crayon.

In 1921 J. W. Bell<sup>6</sup> reported his experience with Fabre's method. This method consists in radiographing the pelvic inlet at the same time the region is being measured by a notched frame, the teeth of which are 1 cm. apart. These scales undergo the same distortion as the inlet, being in the same plane; and upon developing the plate the number of teeth correspond to the number of centimeters, regardless of the dimensions of the image.

Concerning all the methods yet described it may be said in general that they either require too elaborate methods of calculation, special apparatus, or other features which for general use, render them impractical.

Before proceeding to the description of the method which I wish to present it is essential to give some attention to the problem itself and its application to practical obstetrics.

I think that you will agree that the most important plane of the pelvis from an obstetrical viewpoint is the inlet or superior strait. Furthermore the methods of pelvimetry now in general use, particularly the measuring of the diagonal and external conjugate diameters give at best only an approximate estimate of but one diameter of this plane, the anteroposterior.

If it then should become possible in cases where a contraction or deformity of the superior strait is suspected to outline graphically by a simple method a diagram of the pelvic inlet in its true proportions, I believe that it would constitute a very valuable aid to obstetric procedure. I feel that we are able to do this with the method I wish to describe.

Let us consider the obstacles that it is necessary to overcome in considering this problem. The chief difficulty is that of distortion which takes place because of the distance of the part to be measured from the sensitive plate. This is caused by the divergence of the rays from the target to the plate. (See Fig. 1.)

Increasing the distance between the target and the plate lessens the divergence and distortion, the rays which pass through the pelvic ring becoming more perpendicular or normal. It is obvious that in order that the distortion thus produced may be equal in all directions it is essential that the target shall be placed over the center of the superior strait and that all portions of the plane to this strait shall be equidistant from the sensitive plate. This is found possible with the patient in the semirecumbent position with the back of the patient arched in a manner to be described later. In order to make certain that the promontory of the sacrum and the symphysis are in the same horizontal plane a Martin's pelvimeter is placed upon the patient in the same posi-

tion as that used to determine the external conjugate or Baudeloque's diameter. One point of the pelvimeter rests in the depression under the spine of the last lumbar vertebra and the other rests on the skin over the upper and anterior margin of the symphysis pubis.

Almost all of the workers in the field have stated that it is impossible to bring the plane of the superior strait in the living subject parallel with the horizontal. When the pelvimeter is applied with the patient in the ordinary semirecumbent position this is so, the posterior point of the instrument being lower than the anterior. If, however, just before the exposure is made the patient arches her back more or less as

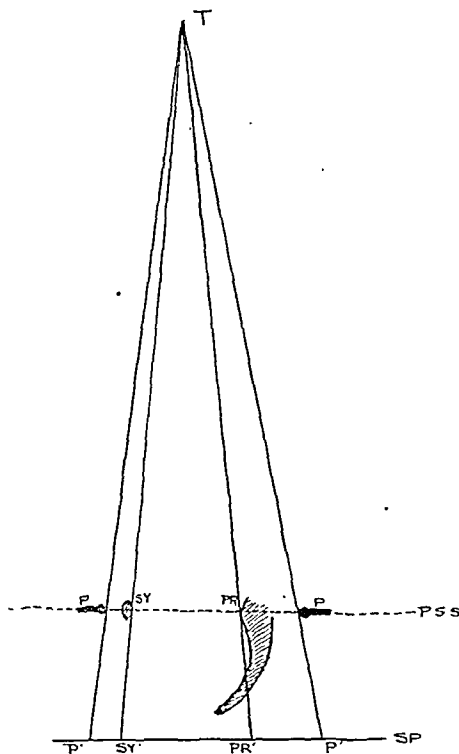
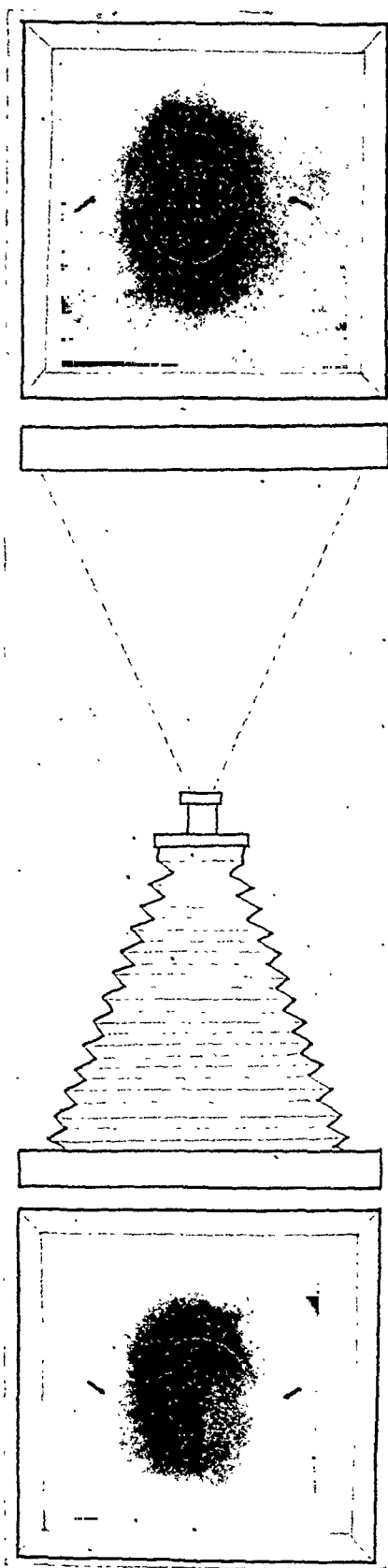


Fig. 1.—*T*, target or tube. *PSS*, dotted line. Plane of superior strait. *SP*, sensitive plate. *P*, ends of pelvimeter—placed on patient as in measuring external conjugate.

Note: If the plane of the superior strait is parallel with the sensitive plate the rays from the target will project the outline of the superior strait and the ends of the pelvimeter to the points represented by *P'* *SY'* *PR'* *P'* and these will bear the same ratio to each other as in the plane of the superior strait or normal condition. In other words the outline of the superior strait is enlarged equally in all directions. It must be reduced to normal by method shown in Fig. 2.

needed it will be found that both points of the pelvimeter become equidistant from the horizontal. Arching the back furthermore tends to throw the upper part of the trunk away from the vertical. It is my custom to have the pelvimeter held by myself or an assistant in position while the exposure is made. This for two reasons, first because it can be better maintained without artificial support and secondly to reassure the patient that no harm will come from the formidable looking apparatus overhead.



A.

Positive  
Reduced to normal from negative show-  
ing superior strait normal size.

B.

Negative  
Image equally enlarged.

Fig. 2.—*B*.—Negative plate or film, superior strait enlarged. Ends of pelvimeter farther apart than normal. *A*.—Positive plate or film reduced in extent so that ends of pelvimeter are same distance apart as when on patient at exposure. Superior strait outlined in its true proportion. Measurements obtained with centimeter rule directly on plate.

The target is placed between three and four feet from the plate and a Bucky diaphragm is used because much clearer negatives are produced with this accessory. The exposure is made in the usual manner the patient holding her breath during the exposure. A rather high spark gap is used, eleven to nine inches, and exposures made from fifteen to thirty seconds. It is obvious that the penetration of the rays directed toward the sacral part must be quite considerable in order to register satisfactorily.

The plate or film is developed, dried, and viewed. It will be noticed that not only is the pelvic ring enlarged equally in all directions but also the ends of the pelvimeter are shown farther apart than the actual distance measured on the patient.

It is apparent that the ratio between the actual distance of the points of the pelvimeter and that measured between the photographic images of these points represents the ratio between the actual size of the inlet

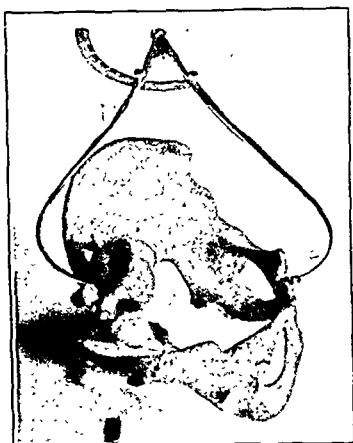


Fig. 3.—Bony-pelvis with pelvimeter in same position as on patient. Ends of pelvimeter equidistant from plane on which pelvis is resting (i. e., sensitive plate). Superior strait parallel with same.

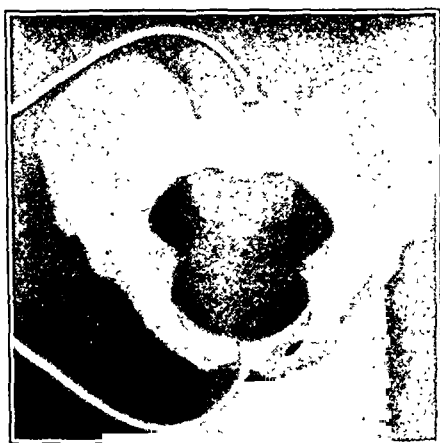


Fig. 4.—Negative obtained from exposure of bony pelvis in correct position. Perfect outline of superior strait.

and the increased size as shown upon the negative. With this knowledge the question of mensuration becomes one simple proportion.

In order to obtain a more graphic and permanent record a picture of the outline of the superior strait in its true proportions is produced, a positive image of this negative reduced to such extent that all distortion is corrected and the superior strait is represented as it actually is. This is accomplished by means of the camera. I have used an 8x10 view camera with a good steady tripod. The negative is placed in the x-ray view box or other illuminating apparatus and a picture made on a plate or film. In focusing, the reduction must be made so that the ends of the pelvimeter shadows in the negative shall be the same distance apart on the ground glass as when measured on the patient. Thus if the pelvimeter read 20 cm. on the patient at the time of exposure and

in the negative measures 24 cm., these points must be 20 cm. on the ground glass when focusing so that in the positive picture produced they will be the same distance as in the original instance. The positive thus produced will be an outline of the superior strait in its true dimensions and diameters may be measured directly with a centimeter rule.

It may be useful to mention certain points in technic that have helped



Fig. 5.—Positive picture. Normal pelvis. Negative unretouched showing outline of superior strait.

in developing the process. In order to secure accurate focusing it is useful to outline on the negative by means of a red wax pencil or india ink the outline of the superior strait and the ends of the pelvimeter. This produces in the positive a white line from which the various diameters are easily measured.

In obese subjects, in order to shorten the necessary exposure required, the target is best used a little nearer the plate, say three feet. The dis-

tortion thus produced is of course somewhat greater but is easily corrected when making the positive picture.

A word or two might be said as to the applicability of the method to pregnant patients. There is no reason why it should not be used during the first six months of pregnancy. Later than this the amniotic fluid and increased size of the uterus and fetus would probably form obstacles which would not permit of good pictures.

The question has been raised from time to time as to the possible deleterious effect of the roentgen ray upon the fetus in utero. Edelberg<sup>6</sup> in 1914 showed that the danger of injury by this means was negligible. He observed the condition of a child which had been conceived while the mother was under the effect of full x-ray treatment, one quarter of the total quantity of the treatment falling into the period of gestation. The child was born at term, fully developed, with all signs of maturity. Nothing pathologic was noticed and the child was well nourished.

In the early development of this method numerous experiments were made photographing dried pelvises. It was found that a positive image could be produced which would be accurate almost to a millimeter. Later the direct conjugate was measured on a patient during a laparotomy. Following her convalescence she was measured by means of the above method and a pelvigram of her pelvis was produced which was accurate in its anteroposterior diameter almost to exactness.

In conclusion I wish to thank Dr. Louis H. Wheatley, the Roentgenologist at Grace Hospital, for his interest and cooperation in the preparation of this work. To Dr. Wheatley belongs the credit of having worked out the exposures and other points of roentgenologic technic with which I am unfamiliar.

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59 COLLEGE STREET.

(For discussion, see p. 316.)



## REGARDING RECENT EFFORTS TO REDUCE MORTALITY IN CHILDBIRTH\*

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**D**URING recent years, the medical profession, as well as those outside the profession interested in public health work, have been endeavoring to find measures of practical value in reducing the present high mortality associated with childbirth in New York City.

The medical profession in general has always realized the dangers to the mother and child during pregnancy and labor, and the high mortality of the child during the first few weeks following delivery. Yet, when the records were published by the Department of Labor, through the Children's Bureau, of the thorough investigation made throughout the entire registration area of the United States, a waste of human life each year from causes incident to childbirth was shown which seemed almost incredible.

The actual total figures including those deaths outside the registration zone can only be estimated.

De Lee has stated that there must be at least 20,000 women and 75,000 babies die each year from lack of proper care during childbirth. We must also take into consideration the innumerable number of women, who, in carrying out the greatest and noblest function of their lives, are left invalids for life from infection or lacerations. In cities where hospitals are available, a small proportion sooner or later seek relief in the gynecologic wards of the hospitals. Some idea of the prevalence of these conditions resulting from childbirth is shown when the records reveal the fact that they are the cause of over one-half of all operations performed in gynecology.

We must also, in considering this great problem, call attention to the number of children who, injured during labor, survive to become later a burden to the family or state, as mental defectives, idiots or epileptics.

The fact that the records show no reduction in the fatalities connected with maternity during the past twenty years, is responsible for the recent investigations to ascertain the reasons, with the hope of finding measures which might tend to reduce this mortality. Records are available to show that most obstetricians for the past twenty years in their private practice, have been able to demonstrate that careful observation throughout pregnancy and the puerperium, and proper management at the time of delivery, will prevent most of the complications which are responsible for causing this high mortality.

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\*Read at a meeting of the Section on Obstetrics and Gynecology of the New York Academy of Medicine, May 23, 1922.

The failure to reduce the maternal mortality has been the inability to provide proper care to all classes. The problem we have to meet at the present time, is to find the best way to provide this care. The one outstanding obstacle, to provide better care, and this has always resisted previous efforts, is the ignorance of the people of the dangers associated with childbirth. The belief that the childbearing function is a normal function, has been handed down through all the ages of the human race. The fatalities frequently connected with it are today looked upon in the same light of superstition and almost the same degree of fatalism as they were hundreds of years ago.

The experience of those who have devoted their lives to the study and practice of obstetrics, has shown that not more than one-half of pregnancies are normal.

The fact that so many women are known to have escaped the dangers of childbirth without having had proper care, only makes more difficult the task of impressing on the minds of the public the necessity of taking precautions in every case against the development of complications, so often serious to mother and child.

The fact that the function of childbearing is so old and familiar, makes it more difficult to bring new ideas to control its management. So long as the State and the public are indifferent to, and ignorant of, the large numbers of women and babies lost yearly in childbirth, there can be little or no progress made in improving this condition.

Those interested in the problem of providing better care, have two objects in view; first, education of the public to appreciation of the dangers due to lack of necessary care, and second, to find the means of providing this care for all classes of people.

In calling the attention of the people to the dangers associated with childbirth, the records of the Children's Bureau have been widely distributed by the Government. At the same time, pamphlets were distributed showing the importance of prenatal care. The Sheppard-Towner Bill, providing aid to States for better maternal care, has been passed by Congress and is now a law. This probably will, when carried out by co-operative action of the States, be responsible for the beginning of a decline in the present high mortality rate. It is a tremendous advance over any other method advocated for the education of the public regarding the dangers due to lack of proper care in childbirth. It will be the means of educating mothers throughout the country on the importance of the hygiene of pregnancy, the importance of medical observation at frequent intervals from the beginning of pregnancy, the necessity of cleanliness at the time of delivery and the need of special attention to the health of the baby in the early weeks.

Statistics are available to show that the greatest need of this education today is in the rural districts and small towns. The larger cities

have already accomplished remarkable results by educating mothers through nursing organizations, which have provided maternity centres, distributed throughout congested areas. The nurses employed at these centres are specially trained in the principles of hygiene of pregnancy and in the value of prenatal care.

In New York City during the past six years, such organizations as the Maternity Centre Association, the Henry Street Settlement, the A. I. C. P. Diet Kitchen Association, Maternal Aid & After Care Circle, and the Board of Health, have accomplished a great deal in educating the public to the great need of better maternal and infant care. They have also been the means of educating a large number of nurses in the principles of the hygiene of pregnancy, and the importance of obstetrical nursing. Many of these nurses have, after they have been trained, gone to other cities to start and aid the educational work. The thoroughness with which this work has been carried on in this city, has been studied and followed in many other cities.

Unfortunately, the efforts now being carried out locally and nationally will not, in my opinion, be followed by any immediate widespread reduction in mortality.

At the present time, there are many who are interested in the efforts to reduce the mortality connected with childbirth, who have the idea that this can be accomplished in the same manner, and with the same remarkable results, which have been demonstrated in the control of tuberculosis and typhoid fever.

They know that those in the profession who have devoted many years to the study and practice of obstetrics, have always been able to care for their patients so as to avoid most of the complications otherwise so frequently seen.

It has been evident that when a disease was known to be preventable the mortality from that disease was quickly reduced through education of the public regarding the necessary measures of prevention. They argue that if diseases, such as typhoid fever and tuberculosis, are preventable, and if reduction of mortality followed the campaign of public education, why cannot the same results be obtained in preventing the serious accidents and complications occurring during pregnancy and childbirth?

Also, that if surgeons have reduced the mortality due to infection in operating by following the principles of asepsis, why can we not prevent wound infection at the time of delivery? Infection at the present time is responsible for half the number of deaths of mothers, and is also the cause of invalidism in countless other numbers who recover.

If the principles of hygiene which are now being so generally carried out in the larger cities by welfare organizations are of aid in reducing mortality in infants *after* the first month, why do we have a loss of life

during the first month that is accountable for one-half of the total mortality of infants during the first year? .

The reason that we shall be unable to show any great immediate reduction in maternal and infant mortality that is comparable with the results obtained in medicine and surgery, is that at present the number of trained physicians available is inadequate.

In reducing the mortality in typhoid fever and tuberculosis, immediate results followed the carrying out of principles of hygiene and sanitation through education of the public. However, this success was not due to sanitation or hygiene alone, but was the result of the carrying out of these principles by the medical profession. The best results in tuberculosis have been obtained where the medical profession have been able to diagnose the disease at the onset, which is only possible where medical men with special training are available. Fortunately there are sufficient numbers of these men who have had the opportunity to obtain this training.

In surgery, the remarkable results which have been obtained during recent years, are due not only to the fact that operations are performed for the most part in hospitals equipped with every facility for eliminating infection, but equally so to the fact that there are available a sufficient number of surgeons who have the knowledge to make a proper diagnosis and sufficient training to enable them to develop skill in operating.

The constantly increasing number of general hospitals throughout the country is the means for providing for a still larger number of men to obtain a thorough training in the principles and practice of surgery. A continued reduction in the mortality from surgical conditions, will be assured by the increased number of trained surgeons available in the future.

In providing proper maternity care, even after we have obtained the results which might follow public education, the problem is far different from the problem in medicine and surgery. Education will, first of all, show the mother the necessity for placing herself under medical observation as early in pregnancy as possible.

The education the mother receives in the principles of hygiene, may enable her to escape toxemia during pregnancy, but if toxemia should develop, it is only by the frequent observation of the patient, by a physician who has been properly trained, that the most serious results are preventable through the recognition of its early symptoms.

If we are to reduce the present infant mortality in babies born healthy, a great deal may be accomplished by teaching the mother the importance of breast feeding, and the principles of hygiene in caring for her newborn child. But this knowledge alone, important as it is, is of little use unless adequate medical supervision is available.

There should be general knowledge of what is being accomplished by

prenatal care before we shall be able to find the means of rendering this care to all classes of patients. At the present time records of private maternity hospitals have demonstrated beyond doubt that their low rate of mortality is a result of the prenatal care which has been given to their patients.

Prenatal care means the protection of the mother from many of the complications which are apt to develop during pregnancy; first, from certain conditions due to pregnancy itself; and second, when other conditions or diseases are found which affect, or are affected, by pregnancy.

In the first class of complications we commonly find toxemia, miscarriage, premature birth, placenta previa, and premature separation of the placenta; while in the second class, syphilis, chronic diseases of the heart, lungs and kidneys, and acute infections, such as pneumonia or influenza. As these conditions are recognized as being largely responsible for the more serious results to mother and child, it is quite clear that treatment can be better carried out the earlier in pregnancy the patients are under medical observation. The essential point then in obtaining results, is to emphasize the importance of medical observation throughout pregnancy.

Syphilis, long recognized for its disastrous effects on the child during pregnancy, can be favorably influenced by early treatment in most cases. Routine examination of the blood in all cases must be provided and thorough treatment instituted.

One of the most striking and prompt results in prenatal care has followed the instructions and carrying out of the principles of hygiene throughout pregnancy. Proper diet and eliminating constipation, together with frequent examinations of the urine and blood pressure, have greatly reduced the number of cases of toxemia, and no doubt has done much in preventing serious results to mother and child from eclampsia, miscarriage, premature labor and premature separation of the placenta. Only in recent years, in the prenatal clinics at Bellevue, and Manhattan Maternity Hospitals, has any effort been made to have the patients apply for care in the early months of pregnancy. As a result of more careful observation of these patients throughout pregnancy, we feel almost certain, at the present time, of preventing the development of eclampsia.

At Bellevue Hospital where we care for a large number of women admitted without prenatal care, we still see many cases of eclampsia. Owing to the necessity of keeping a number of beds available for emergency cases, in only about fifty per cent of our patients are we able to give prenatal care. During the past three years we have not had eclampsia develop in patients who have been under observation in the prenatal clinic.

In cases of placenta previa we are obtaining better results where pa-

tients are receiving prenatal care. Delivery is less dangerous to the mother if the condition is recognized early and the patient sent to the hospital. Delay in receiving medical attention makes the results serious to both mother and child because of the unnecessary loss of blood previous to the time of delivery.

The great loss of life in babies unborn or delivered prematurely, can only be prevented by thorough medical treatment, not only throughout pregnancy, but even after the patients become pregnant. The most common causes of miscarriage and premature labor, as well as of stillbirth, are chronic nephritis and syphilis. Proper medical supervision during puerperium should, in many cases, prevent miscarriage and placenta previa in future pregnancies by lessening the number of cases of subinvolution and retroversion.

The New York State Board of Health records for 1921 outside the City of New York, show 2170 deaths due to prematurity out of a total of 8464 deaths of infants under one year.

The records of the Bureau of Child Hygiene of the New York City Health Department show no reduction during recent years in deaths of infants due to congenital causes, although they show a reduction in the other causes of death during the first year far in advance of any of the other large cities in this country.

It has been my experience during the past ten years, in observing the results from prenatal care at Bellevue and Manhattan Maternity Hospital, that the results obtained are directly proportional to the character of the medical care the patients receive in the clinics.

It is essential that the opinion of some physician, who has been thoroughly trained in obstetrics, should be available at all times at prenatal clinics. It is our custom at both hospitals to have at least one of the assistant attendants present at each clinic to assist and act as consultant to the resident who, with the entire interne staff, attends all clinics.

The knowledge necessary for ascertaining complicating conditions is not easily acquired; so that the direction of the management of a patient presenting abnormalities must be decided by the thoroughly trained obstetrician. This is especially important in recognizing in advance, cases having a contracted pelvis.

Fatalities of mother or baby are almost always associated with complicated labors, or in normal labors where there has been some interference on the part of the physician or midwife. To safely deliver a living child at term, in most cases of complicated labor, and at the same time protect the mother from lacerations, undue loss of blood, and infection, call for unusual knowledge, skill and obstetrical judgment on the part of the operator.

If maternity hospitals are able to show a low mortality in delivering

patients with complications, and if prenatal care offers a means of either preventing these complications from developing or recognizing cases which might require skilled care at the time of delivery, have we not in utilizing maternity hospitals for the care of complicated cases only, and in a widespread development of prenatal clinics, the means of obtaining practical results?

Maternity hospitals are providing care at present for 36 per cent of the 130,000 cases delivered in New York City each year. The midwives are caring for 32 per cent, and the private physicians an equal number. There is no way of estimating how many of these cases are receiving prenatal care. The private maternity hospitals are giving prenatal care to some extent to nearly all their patients. The city maternity hospitals are not providing prenatal care for over 50 per cent of their cases owing to the necessity for maintaining beds for emergency cases.

In New York City during the past ten years, figures show a steady decline in maternal deaths from puerperal infections. This reduction has not been evident in any other city.

There are two factors which may account for this reduction; first, the large number of cases cared for by maternity hospitals with the relatively large proportion of cases receiving prenatal care; and second, the control and supervision of midwives in their practice and the high standards maintained in issuing new licenses to practice.

There is no question regarding the continued need for midwives in this city. So long as this need exists, the problem for providing prenatal care to their patients must be solved, if we are to see any great reduction in maternity mortality rates. These cases, as well as a large percentage of those cared for by private physicians without prenatal care, account for the large number of complicated labors.

The records of 10,296 cases delivered by midwives at the training school for midwives at Bellevue Hospital, show beyond question that with proper medical supervision midwives can be instructed to deliver safely normal cases.

At the present time the medical schools are making greater efforts to reduce the dangers of childbearing by providing for better training of the students. Graduates of the future must have more clinical teaching than they ever have had in the past. It must be firmly impressed on the student that, though he can be trained to safely care for a normal case, he is no more prepared to manage cases requiring an obstetrical operation, unless he shall first prepare himself by special training in some maternity hospital, than he is to do an operation in general surgery. No physician, without special training, would attempt to perform a serious surgical operation without subjecting himself to universal condemnation by the public and profession at large.

The limitations to which a man without special training in obstetrics

can go in handling abnormal cases must be made explicit and definite. There should be sufficient clinical material available to enable students to actually deliver a large number of cases following a safe technic under the guidance and instruction of a qualified teacher. The graduates from the school of midwives are required to have attended one hundred deliveries and to have delivered twenty normal cases, while the requirements for graduates from medical schools in this State are to deliver only six cases.

The future teaching of obstetrics, in my opinion, must be based on two factors; first, a thorough knowledge of the importance of prenatal care; and second, the necessity of aseptic precautions and the avoidance of unnecessary interference during labor.

Students should be taught that with the reduction of the number of complications by intelligent prenatal care and a knowledge obtained in advance of the size of the pelvis the necessity for performing obstetrical operations will be largely reduced.

The second factor which must be emphasized in preparing students to practice safe obstetrics is the need and importance of a simple and safe technic at the time of delivery.

Students must become accustomed to performing safe deliveries by having practical experience under trained instructors in the hospital or in the home. They must have demonstrated by observation the normal physiologic process of labor by methods which do not endanger the life of the mother, or cause, as formerly, so many infections through vaginal examinations.

A familiarity with, and knowledge of normal labor, based on intelligent observation, prepares them to recognize abnormal conditions early in the progress of labor. Ignorance of normal labor often leads to some operative interference endangering the lives of both mother and child. The indiscriminate use of forceps by those who have not a thorough knowledge of normal labor, is a frequent cause of serious after-effects in the mother from lacerations and infections, and also of high mortality in babies, either at birth or during the early weeks of life.

At the present time we have at the New York University, and Bellevue Hospital Medical College, the same difficulty in teaching obstetrics that is found in all medical schools; that is, the inability to properly utilize our clinical material. As a result, we have been forced to devote more time than is necessary to theoretical teaching, and by failing to provide more practical work in the delivery of normal cases, under instructors, we have failed to get the results we should.

Before we shall be in a position to reduce infant and maternal mortality in New York City, a sufficient number of prenatal clinics must be maintained to provide care for the large number of women who at present are not receiving such care during pregnancy, and the maternity



hospitals, which are now giving hospital care to a large number of normal cases, must be utilized more for the care of abnormal cases.

The combined efforts of all agencies, public and private, now interested in this problem, could, it seems to me, organize and maintain these clinics.

In New York State the carrying out of the provisions of the Davenport Bill should be of great help in reducing the mortality rate. The problem in the rural districts is being made more difficult each year by the inadequate number of physicians. If training schools could be established for the training of graduate nurses in caring for normal cases similar to the Bellevue School for Midwives, we would have available a number of visiting nurses, in small communities, who would be able to provide intelligent care for mothers and babies now deprived of medical advice and care.

#### CONCLUSIONS

1. Education of the public regarding the dangers of childbirth without proper prenatal care, must be continued.

2. Clinics for providing prenatal care should be multiplied.

3. Maternity hospitals should provide care for a larger number of abnormal cases.

4. Medical schools should educate their students to give more thorough prenatal care to patients, provide facilities for training students in care of more normal cases and should emphasize the necessity of obtaining special training before performing obstetrical operations.

5. Provision should be made for the training of visiting nurses in practical obstetrics to assist in providing care in the rural districts.

158 WEST FIFTY-EIGHTH STREET.

(For discussion, see p. 325.)

## MALIGNANT PAPILLOMA OF THE KIDNEY\*

BY WM. EDGAR DARNALL, A.M., M.D., F.A.C.S., ATLANTIC CITY, N. J.,  
AND JOHN KOLMER, M.D., PHILADELPHIA, PA.

**M**ALIGNANT papilloma of the pelvis of the kidney seems to be a very rare condition. A. O. J. Kelley described the first case reported in this country in 1900. Since that time there have been but 18 cases reported in America. The foreign literature contains a total of 38 cases. The American cases have been reported by Babcock, Watson and Cunningham, Lower, E. S. Judd, Hyman and Beer, C. H. Mayo, Stevens, Goldstein, two by Kretschmer, Miller and Herbst, three by Brascn, and one by McCown. There are two unreported cases by Burford of St. Louis and Parmenter of Buffalo. McCown in reporting his case made a very thorough study of the literature. He presents abstracts of 46 cases, including the 38 foreign cases and his own. This brings the total number of cases in the literature up to 56, the case reported by the writer below makes the fifty-seventh on record. Rather than repeat the cases collected by McCown I take the liberty of referring to his article (*Jour. Am. Med. Assn.*, October 30, 1920).

From an analysis of the cases thus far recorded the incidence of papillary epithelioma is more common in males than females in the proportion of two to one. Ages vary, the youngest a boy and the oldest a woman of 86. The writer's case was a woman of 82. The etiology is unknown. Some authors are inclined to ascribe as the cause inflammation, others stone. The tumors vary in size from multiple small isolated bud-like growths to a single large cauliflower mass filling the renal pelvis and producing, as it grows, destruction of the kidney parenchyma.

The tumor may start and remain localized in the kidney but the striking tendency is to involve secondarily either by direct extension or by implantation, the lower urinary tract. Of the cases reported to date, 25 showed involvement of the ureter while in 18 the tumor had invaded the kidney ureter and bladder. The symptoms vary considerably with the size of the tumor and the associated pathology. Hematuria is the most constant sign. It is usually intermittent in character and may vary in severity from a slight cloudiness to a copious hemorrhage. Pain is more or less inconstant but radiates from the kidney down the loin.

If the symptoms are not interrupted by surgical treatment they may extend over a period of years. In the writer's case, which was inoperable

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\*Read at a meeting of the Obstetrical Society of Philadelphia, April 6, 1922.

on account of the age and feebleness of the patient, the symptoms persisted for about six years. Usually, however, termination is seen relatively early. All cases, especially in adults, if there is intermittent hematuria and pain in the kidney region, should suggest this condition. It is quite possible that some of the cases diagnosed as essential hematuria may be of this type. This condition should be suspected if the roentgenograms are negative for stone, there are colicky attacks of pain radiating along the course of the ureter, a diminished or absent function of the suspected kidney and a palpable mass in the loin. If in addition to this, cystoscopy reveals a papilloma in the bladder or the ureteral orifice, the pyelogram shows a filling defect in the pelvis of the kidney and the urine contains unidentified epithelial cells, the presence of a papillomatous tumor is quite certain.

Judd regards the papillary structure as proliferating epithelium of the renal pelvis. The exact nature of the tumor seems to be based on the appearance of the epithelial cells within the connective tissue beneath the tumor. Papillary tumors of the pelvis of kidney are usually if not always multiple. These neoplasms are divided by Judd into three classes: (1) The simple papillomas which show throughout their entire development and evolution the characteristics of all such tumors, (2) The epithelial papillomas which almost immediately show the characteristics of malignancy and (3) those tumors which apparently change from a supposedly benign to a malignant growth. For practical purposes it would seem best to credit malignant tendencies to all these papilloma and treat them in a radical manner.

From the standpoint of treatment the cases of renal papilloma may be divided into two groups, with and without involvement of the bladder. In all cases nothing short of complete removal of the affected kidney and as much of the ureter as possible should be done. If there should be implantation in the bladder, fulguration may be done later. If on the other hand fulguration should be done on bladder papillomas and trouble higher up in the ureter and kidney is overlooked, nothing is accomplished and endless trouble may ensue.

CASE REPORT.—Mrs. C. K., age eighty-two, the mother of six children, thin, anemic and feeble. She has never been robust, has suffered from invalidism more or less all her life. She has a history of right nephroptosis. About four years ago the writer was called, the condition explained and he was asked to push the kidney up in place as it had come down by reason of the journey from her home in Brooklyn to Atlantic City. She stated that for two or more years she had suffered from intermittent hematuria and that her Brooklyn physician relieved her discomfort when the kidney came down by replacing it. On attempting to carry out her wishes I discovered a mass in the right loin about the size of a large grape fruit apparently elongated at both ends. It was more or less movable and was replaced to a higher level. The next day she began to bleed and this continued for ten days. I was uncertain as to the character of the mass but my impression was that of an hydro-nephroma.

The patient's lungs, heart and circulation were normal, blood pressure, 110/85. She was feeble and resisted suggestions of cystoscopy and x-rays to the end. She was under my observation most of the time for a period of four years. Bleeding sometimes would last for weeks at a time and then cease. During the intermissions she would be able to be up and about the house. The last year or more of her life was spent practically in bed and it seemed rather unusual that during the last months of her life attacks of bleeding were less frequent and did not last as long. There were during my observation of her case two or three distinct attacks of ureteral colic.

One day she called attention to the fact that she had passed an unusually large amount of urine and on examination the mass in the loin had disappeared and never returned. There is no doubt that the mass had been an hydronephroma.

From time to time there were attacks of gastric trouble, distention, nausea and vomiting and an occasional rise of temperature of a degree or two. The patient gradually failed, and died, Nov. 8, 1921. At autopsy, only abdominal examination permitted. The stomach was normal, the gall bladder thickened and distended showing presence of cholecystitis but there were no stones. There were old adhesions about the pyloric end of the stomach, duodenum, and gall bladder. There were no enlarged glands and no involvement of the intestines. The pelvic organs showed no gross pathology but were atrophied. The left kidney and ureter were normal. The bladder was normal except for some small gravelly concretions but there was no evidence of cystitis or papilloma implantation in the bladder. The right kidney was but slightly larger than normal. The pelvis of the kidney was overdistended and the ureter, bluish in color, was at its upper end about four times its normal size. On splitting the kidney and ureter open the ureter and pelvis of the kidney showed no gross lesions and were smooth but at the apex of many of the pyramids of Malpighii were little tufts of coral growth masses, or perhaps it would be better to call them cauliflower tufts. In the pelvis itself which was smooth there was an organized blood clot. The macroscopic appearance of the kidney suggested a chronic nephritis.

The kidney was submitted to Dr. John A. Kolmer, Professor of Pathology at the University of Pennsylvania. He reported that: "The histological examination of the kidney shows the presence of a papilloma in the pelvis which has undergone malignant change—the correct designation should be epithelioma of the pelvis of the kidney. This growth is fairly well circumscribed with fibrous tissue and for this reason gives a good prognosis on account of its slow growth."

*(For discussion, see p. 319.)*

## ACCIDENTAL PERFORATION OF THE UTERUS: WITH A REPORT OF THREE CASES\*

BY GEO. W. OUTERBRIDGE, M.D., PHILADELPHIA, PA.

ACCIDENTAL perforation of the uterus probably is caused in the majority of instances either by the forcible passage through it of a catheter, bougie, or some similar more or less rigid instrument by the patient herself or an accomplice in an attempt to induce abortion, or else by puncture from placental forceps, curette, or other instrument in the hands of the surgeon during the process of evacuating retained products of conception from the puerperal uterus following abortion or full-term delivery. It is undoubtedly true that this accident may occur without any serious sequelae, and it is highly probable that in many instances it has even occurred quite unsuspected by either patient or surgeon. If the peritoneal cavity escapes infection, and there is no intestinal injury, the small uterine perforation may undergo spontaneous healing and no further trouble ensue, but that severe intraabdominal lesions may result from such injuries, however, even in the absence of any immediately alarming symptoms, is also undoubtedly true, wherefore, all cases in which perforation of the uterus is known to have occurred, or is suspected, should in my opinion, either be subjected to immediate laparotomy, or else be kept under most careful observation, under conditions that will permit of prompt action upon the first evidence of intraabdominal trouble.

The following cases of accidental perforation of the uterus, which have come under my observation in recent years, present varying points of sufficient interest in this connection to warrant their brief presentation before this Society.

CASE 1.—Mrs. B., age twenty-six years, admitted August 2, 1915, with the following history:

She had had four children and four miscarriages, the latter all within twenty months. Three weeks before admission a curettement for incomplete miscarriage was attempted by her family physician, but was not completed on account of hemorrhage. On the day of admission, another attempt to empty the uterus was made by her physician, who recognized during the course of the operation that with the placental forceps he had pulled a piece of intestine into view in the vagina, whereupon he desisted from all further treatment and sent the patient to the hospital.

On admission, about 8 P. M., she was absolutely tranquil, complaining merely of insignificant soreness in the abdomen, but of no definite pain. Her pulse was 80, temperature normal. On examination, she showed very slight vaginal bleeding, slight tenderness in the right lower quadrant of the abdomen, and a mere suspicion

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\*Read at a meeting of the Obstetrical Society of Philadelphia, April 6, 1922.

of increased rigidity in the same region, so slight in fact, that there was disagreement between the resident physician and myself as to its presence. However, on these vague symptoms, and largely upon the family physician's statement that he was sure he had perforated the uterus and pulled down a piece of intestine, immediate laparotomy was determined upon. This revealed the following conditions: In the fundus of the uterus was found a ragged area of perforation, measuring about 1.5 cm. in diameter, which was oozing slightly. The tubes and ovaries were normal. A loop of ileum measuring about 14 inches in length, had been torn completely free from its mesentery, the vessels of which had retracted and were not bleeding to any extent. The wall of the bowel was not appreciably injured, and there was no opening into the lumen. This loop of bowel had slipped back out of the uterus, and was not projecting into the perforation when the abdomen was opened. Because of the complete severance of the blood-supply to this portion of the gut, however, resection was, of course, necessary. This was performed with end to end anastomosis, following which the body of the uterus was removed by a high supravaginal hysterectomy, leaving both tubes and ovaries, as this seemed wiser than attempting to repair the ragged perforation in the uterine wall.

The patient made a satisfactory recovery, and left the hospital in about three weeks.

In this instance, it seems certain that had a waiting policy been pursued, which, except for the doctor's statement, might have appeared justifiable in view of the patient's condition on admission, gangrene of the torn loop of ileum would almost certainly have supervened, by which time the patient's chances of withstanding operation would have been appreciably less.

CASE 2.—Mrs. M., aged twenty-six, admitted December 22, 1916, with the following history: She was delivered of her fifth child, November 3, 1916, immediately following which she had a severe hemorrhage. Five days later, she had a second hemorrhage, since which time she had had eight more severe hemorrhages, occurring at intervals of five or six days, for several of which she had to be packed by the attending physician. Examination on admission showed an extensive cervical laceration, the uterus normal in size, retroverted to the second degree, and freely movable. The left ovary was slightly enlarged and there was some resistance in the right vaginal vault. Blood count, hemoglobin 20 per cent, leucocytes 7,200, red cells 2,240,000. Wassermann reaction negative. Operation December 27, 1916. After dilating the cervix, a pair of Emmet curettement forceps were carefully introduced into the uterus for exploration; without the slightest sensation of their meeting any resistance whatsoever, an object in their grasp was recognized as an epiploic appendage. A laparotomy was immediately performed, and a small uterus found with an area of perforation in the fundus. The consistency of the uterus was most remarkable, being almost as friable as a piece of Roquefort cheese. Fortunately, there was no intestinal injury necessitating attention. In view of the severe hemorrhagic condition, and the degree of anemia to which the patient had been reduced, together with the obviously degenerated condition of the uterus, it seemed best to remove this; therefore, a rapid supravaginal hysterectomy was performed, following which the patient went through an uneventful, but somewhat protracted convalescence because of the anemia. Two days after operation, the hemoglobin was 15 per cent and the red cells 1,330,000. On January 5, 1917, the hemoglobin had returned to 20 per cent and the red cells to 2,070,000, on the twelfth, the hemoglobin had risen to 30 per cent, on the 26th, to 40 per cent, and at the time of her discharge on Feb. 18, it was 70 per cent.

Histological examination of the extirpated uterus shows an extremely interesting condition. Just beneath the endometrium are areas of the most remarkable degree

of hyaline degeneration that I have ever seen in a uterine wall. Many portions of this show practically no muscular tissue whatever, having been almost completely transformed into hyaline tissue, which takes a pale, diffuse, pinkish stain in hematoxylineosin preparations. Many of these areas are irregularly circular or oval in outline, quite strongly resembling in general appearance corpora fibrosa of the ovary. Many of them contain a very small blood vessel in the center, the diameter of the latter being possibly about one-twentieth that of the entire hyalinized area. In other such areas again, no central blood vessel is demonstrable. It appears highly probable, therefore that all these areas originated from extensive hyaline degeneration of the blood vessel walls, with resultant diminution, and in many instances, eventual obliteration of the lumen and consequent profound alterations in the uterine circulation, producing on the one hand the repeated severe hemorrhages, and on the other, the friability of the uterine tissue and consequent ease of perforation.

In this instance, while no intestinal or other traumatic lesion was found on opening the abdomen, aside from the perforation of the uterus itself, I am convinced that in view of the condition of that organ, as found both on gross and microscopical examination, its removal was urgently indicated. While we do not ordinarily choose to do a hysterectomy with the hemoglobin hovering between 15 and 20 per cent, and the red cells between one and two million, in this case, immediate and permanent stoppage of the hemorrhage was the first consideration, and the action taken was amply justified by the outcome, as the patient left the hospital in good condition and has remained in excellent health ever since.

CASE 3.—Miss K., aged thirty, admitted July 12, 1921.

The patient's statements are somewhat unreliable as to exact dates, but so far as can be determined, she last menstruated early in April, 1921. On or about May 8, as her period had failed to appear, and she feared the occurrence of pregnancy, she introduced a catheter into the uterus for the purpose of producing an abortion. She says that she experienced no pain, but that on attempting to withdraw the catheter, it broke, and only a short piece came away. For several weeks following this she had more or less constant uterine hemorrhage, accompanied by clots and foul smelling discharge, but says that she experienced no particular pain or discomfort, and continued to lead her regular life until July 8, when she was seized with a severe pain in the right lower abdomen, and passed a very short piece of the catheter, not over three-fourths of an inch in length. From that time on she continued to have some pain in the right lower abdomen, with irregular but not profuse bleeding, until admission to the hospital July 12. She was not confined to bed during this time, however. On admission, the vaginal outlet was found moderately relaxed (subsequently, the history of a previous full term delivery was obtained); the uterus was normal in size and position, but slightly fixed; the left side was negative, but there was some tenderness and a small, hard mass on the right, very superficial, just above the pubic ramus, suggesting possibly induration at the top of the right broad ligament. Temperature on admission was 99.8°, leucocytes 14,000. Following admission and rest in bed, the bleeding stopped, though pain and tenderness in the right lower quadrant persisted, and operation was performed on July 18. A preliminary dilatation and curettement produced merely a small amount of endometrial tissue, which on microscopic examination showed no signs of a recent pregnancy. It was noticeable while doing the curettement that the curette could be introduced considerably deeper on the left than on the right side of the uterus.

Median abdominal incision revealed, immediately upon opening the peritoneum, extensive omental adhesions to the top of the bladder and to the parietal peritoneum in front and to the right of this organ. On freeing these, an area of marked thickening and dense, almost cartilage-like induration of a considerable area of the

anterior parietal peritoneum immediately adjacent to the right side of the bladder was encountered; this was the small, hard mass felt on the right side on vaginal examination. In the center of this mass was a small amount of thin pus. The appearance suggested that a puncture had been made at this point through the bladder wall, but there had been at no time any vesical symptoms, and urine examination at all times was negative. Subsequent careful questioning of the patient, moreover, failed to elicit any history suggesting that the bladder had been injured, or that the catheter had ever been introduced into it, so that the exact etiology of this area of inflammatory reaction is not altogether clear. The uterus was not adherent to this inflammatory area in the peritoneum, or to the bladder, but was normal in all respects, except that four loops of intestine were densely adherent to the left cornu; other than this it was entirely free from adhesions. After carefully liberating the intestinal loops from the uterus and from each other, a small puncture opening, surrounded by an area of congestion, was found in the fundus just median to the origin of the left tube. Both tubes and ovaries were entirely normal in appearance, and were free from adhesions. Further exploration of the abdomen brought to light a piece of stiff, woven catheter,  $12\frac{1}{2}$  inches in length by about  $\frac{3}{16}$  inch in diameter, lying entirely free in the abdominal cavity, somewhat wrapped about by omentum, which latter showed in places considerable inflammatory thickening. On removal, the piece of catheter was seen to comprise the tip, with its eye, at one end, the other end being ragged where it had broken off from the remaining portion. It had evidently been forced completely through the uterine fundus into the general peritoneal cavity, and when removed was lying with the tip in close proximity to the transverse colon. The puncture opening in the uterine fundus had then become sealed by the intestinal adhesions mentioned above. The operation consisted merely in liberation of the intestinal adhesions, resection of a cone-shaped bit of tissue of the uterine wall about the puncture opening, which was then closed by cat-gut suture, and resection of some inflammatory portions of the omentum, with, of course, removal of the catheter from the abdominal cavity. On account of the inflammatory thickening of the prevesical peritoneum, with small amount of pus formation, a cigarette drain was placed at this point for 48 hours. Because of a very suspicious tuberculous history, although no active pulmonary lesions were demonstrable at time of operation, the latter was performed entirely under gas-oxygen anesthesia.

The patient was out of bed on the tenth day, and made an uninterrupted recovery.

In this instance, in spite of the introduction by the patient herself, so far as can be ascertained (and there seems to be no reason to doubt the accuracy of this statement), of a presumably nonsterile, or at least imperfectly sterilized body a foot in length, through the uterine wall into the free abdominal cavity, and its sojourn there for over two months, comparatively insignificant local or general symptoms had manifested themselves up to a few days before the patient's entrance into the hospital. In view of the fact that such symptoms were finally beginning to appear, however, and of the lesions found, namely localized inflammation in the peritoneum, with beginning pus formation, and rather serious intestinal adhesions, it seems highly probable that this favorable state of affairs would not have continued indefinitely in the absence of operative intervention. Aside from all other considerations, the four intestinal loops adherent to the uterine cornu (two portions of the sigmoid and two of ileum) afforded an admirable site for the formation at some future time of an internal hernia between them and the top of the broad ligament.



## INTERMITTENT ASPIRATORY HYPEREMIA IN GYNECOLOGY\*

By JOHN VAN DOREN YOUNG, M.D., F.A.C.S., NEW YORK, N. Y.

IN a paper published in the *New York Medical Journal*, October 5, 1921, I stressed the value of this procedure in the treatment of dysmenorrhea. I will not go over the subject as presented in that article, except to mention a few of the basic facts, but content myself with an analysis of a series of cases in general gynecologic practice treated by this method.

The use of suction for the purpose of removing cervical mucus is not new, but I wish to impress the fact that this is more than simply a suction pump, both in the manner of applying the principle of suction and the method of its use. I have long searched for a method of stimulating the cervix, so that it in turn would cause contraction of the uterine muscle, with a consequent circulatory stimulation; it seemed to me that this must take the form of some suction apparatus, which would at the same time remove the mucus, and cause a congestion of the cervix. It was however not until this instrument was perfected that I could combine suction with cervical stimulation, carried to any desired degree and released without any inconvenience. The long cushion of partial vacuum, the sharp intermittency of the stroke, the ability to prolong the stroke, or the interval, at will, and the ease of the make and break are the essential points in the instrument.

The observations in this paper are purely of a clinical nature, and are from personal notes made at the time each treatment was given.

My early work was done with an imperfect instrument and was without any clear concept of the scope of the method; I have therefore limited myself to the last 221 consecutive cases and what I have learned from them.

It was not until August 6, 1920, that I began to note and record the degree of response to aspiratory stimulation, and note the class of cases in which it was most marked. Since then for convenience of record I have adopted the following terms: —1, 1+, 2+, 3+, 4+, also noting any showing of blood, and whether it came from an eroded cervix without undue pain, or whether it came through the os with a severe cramp-like contraction. In cases marked —1, the uterine muscle could not be made to contract; in 1+, it was indeterminate; 2+ I have learned to call a normal reaction; 3+ an overirritable condition; 4+ observed only postpartum, postabortive or inflammatory conditions, with a uterus that

\*Read at a Meeting of the Section on Obstetrics and Gynecology of the New York Academy of Medicine, May 23, 1922.

stimulation caused a severe contraction closely resembling an early labor pain. In cases marked 2+ the contraction causes a cramp described by the patient as that of an ordinary menstrual pain and in cases marked 3+, a severe menstrual pain.

I fully realize that this division as to pain degree is clinical only, but I feel that it is accurate enough to make it of real value in records, and I have noted a truly remarkable similarity in the description given by all the patients observed. That there is a true contraction of the uterus may easily be demonstrated in cases of retroversion with a soft relaxed uterine body that cannot be replaced, and which seems to disappear on bimanual examination; after aspiratory stimulation this uterus will become clearly outlined and manipulated, and if nonadherent may easily be replaced.

This observation is most readily made in cases of postpartum retroversion with subinvolution.

The question that now presents itself for answer is, how long should aspiratory stimulation be kept up at each treatment? This should be governed by the degree of response, if 4+, two to four stimulations are enough per treatment. Three plus, 4 to 8, 2+ or a normal reaction, the stimulation should be given for five minutes, four to six times per minute. In indeterminate and minus cases two tractions on the piston may be substituted for the usual one, thereby giving a greater degree of stimulation, and the length of time increased at discretion.

It has been interesting to note in my series of cases, the change from 4+ to 2+ and from minus to 2+ or normal.

It is obvious to the observer that the first effect of a suction produced in a glass cup which completely covers the cervix, is to empty the infected glands of the cervix, that are patent, and fill the area with fresh blood. That this actually happens may be seen in any of these cases. At the same time the cervical congestion may be seen, and unless care is used ecchymosis will occur under the mucosa; in badly infected eroded cervixes this is of benefit; but as the mucosa begins to grow it is better not to traumatize it.

Where the lesion to be treated is an infection of the cervical glands alone this instrument may be used as a suction pump only: however, as there is in most of these cases an ascending lymphangitis with a periadnexitis, the aspiratory stimulation is a most important factor.

In circulatory stasis, due to subinvolution, or malposition, or both, the aspiratory stimulation is of the greatest value.

As a method of cervical cleansing and preparation for topical applications it is most serviceable. Where the infected glands have become cysts they may be punctured and pumped empty and the cavity filled with a blood clot.

The glass cup is best applied through a speculum except where the

larger-sized tubes are used; in cases requiring these tubes, trauma of the pelvic floor allows of their easy introduction, or a Sims speculum may be substituted for the bivalve. Where the introitus is small, number 1 or 2 may be introduced after thorough lubrication without any speculum, but care must be taken to be sure the cup is over the cervix and not aspirating the vaginal wall. Also the degree of reaction must be noted by the Doctor and the patient, and if she complains overmuch, the cup should be removed and the cervix investigated; overreaction is not to be desired, and must be watched for in nullipara, inflammatory cases, postabortive, postpartum, and in some circulatory

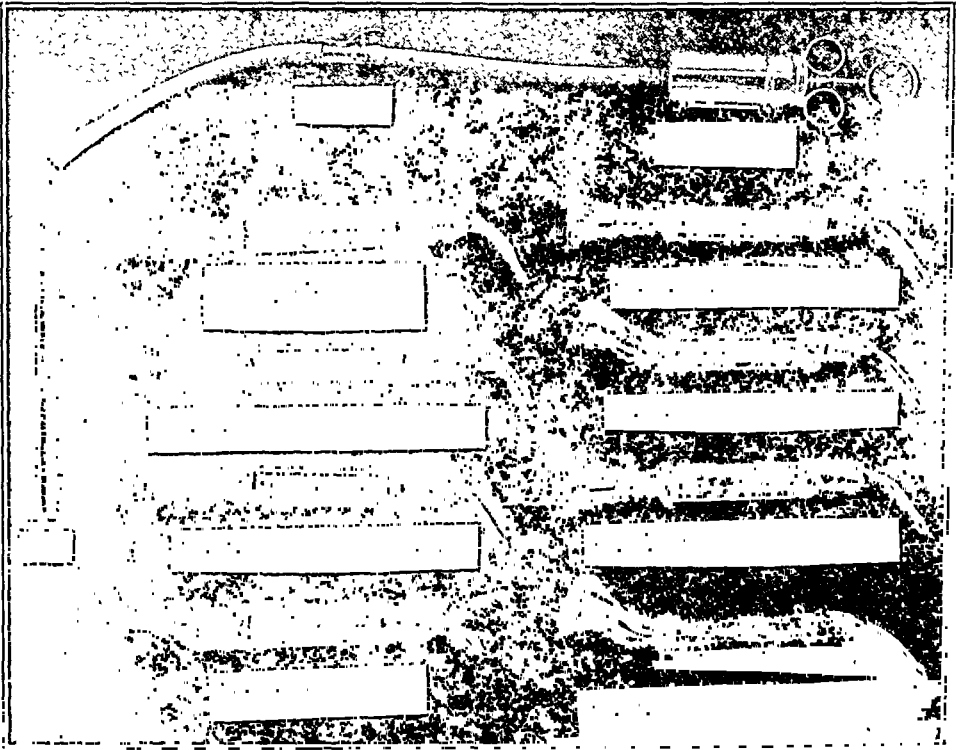


Fig. 1.—The apparatus as devised by the author for the production of intermittent aspiratory hyperemia, with the various types of tubes. Note the length of the vacuum chamber (20 cm.), the location of the air vent for the convenient and quick breaking of the vacuum, also the size and position of the pump for its rapid production.

The cervical ends of these tubes are 2, 3, and 4 cm. in diameter, their shape, to facilitate application. No. 5 is made to remove mucus from the cervical canal, or with a short piece of rubber tubing attached may be used to empty a single gland after puncture. Numbers 1, 2 and 3 for nullipara and numbers 6 and 7 multipara and numbers 8 and 9 for hypertrophied cervixes. All of these tubes may be boiled an indefinite number of times.

stasis cases. This hyperreaction will decrease as the uterus returns to normal. In an excellent article by Gordon Gibson, read before the Section on Gynecology and Obstetrics at the last meeting of the New York State Society, he called attention to the use of the electrocautery in chronic infection of the cervix, and laid particular emphasis on the nonoperative treatment of these cases. I feel sure that a com-

bination of these two methods would increase the number of cures and decrease the length of time of treatment.

There is a class of cases of long-standing deeply-seated infection with cystic degeneration that will resist both methods and require operation, but any addition to the treatment of this condition, that will lessen the number of operations and increase the number of functioning cervixes is worthy of note.

As this is a purely clinical paper I have avoided discussion of the pathology of the cervix, uterus, and adnexa, but, the observations herein contained have been made with a full consideration of this as a basic factor. It is my contention that suction for the sole purpose of removing mucus from the cervix and aspiratory stimulation are two entirely different procedures. In the first the mucus is drawn out by suction, in the second a closely fitting cup covers the cervix completely and a long column of quickly created partial vacuum will cause a hyperemia of the cervix, with an immediate stimulation of the uterine muscle to contraction, and an incidental aspiration of the cervical glands. How far this aspiratory effect extends through the cervix I am not prepared to state.

It is my opinion that this method of intermittent aspiratory hyperemia for uterine stimulation, and the treatment of infections of the cervix by suction, plus hyperemia, are essential to the proper treatment of gynecological conditions.

The frequency of infection of the cervix is a source of surprise to any one who carefully notes the condition, and its importance, as a point of entrance for more deeply seated infection, cannot be overestimated, and, as a factor in the causation of sterility it must be considered.

Of the sixteen pregnancies occurring in this series, I do not claim that this treatment alone relieved the obstruction to impregnation, but the cure of the cervical infection, and relief of the circulatory stasis and the restoration of tone were actual factors in the result.

The two gonorrheal cases, were hopelessly sterile in my opinion without this method: (Nos. 16 and 33.) Number 16 had a vulvovaginal gland abscess, left pyosalpinx, adherent retroversion, infected cervix and lacerations, surely a formidable array of causes for sterility, no matter how wisely operated upon. I know of no other treatment that could possibly have eliminated the infection so that pregnancy could be possible.

Case No. 33 had gonorrheal infection before marriage, involving the vulvovaginal glands, Skene's glands, cervical and tubal infection and was my first case of aspiratory treatment over a very long period of time. The operation plus the treatment, rendered her able to become pregnant and deliver normally, her case in my opinion was permanently sterile.

Case No. 53. An infantile uterus, small vagina, male type of pelvis, and reversal type, seemed to render hope of pregnancy nil, two years of treatment was rewarded by a living child delivered by cesarean section.

Case No. 142, one of double vagina, double cervix, and two uterine bodies, the left much smaller than the right; she had been pregnant twice and lost both by miscarriage; after treatment went to seven and one-half months, and was delivered of a living child which is now alive and well.

To my mind these two cases suggest the probability of circulatory stimulation and uterine exercise developing that organ to a functioning state.

Case No. 147. Sterile sixteen years, except for ectopic  $2\frac{1}{2}$  years ago, with a very badly eroded infected cervix, an ovarian cyst, and a pedunculated fibroid, operated upon at fourth month of pregnancy now nearing term.

Case No. 3. Sterile all her married life.

It is interesting to speculate on the effect of treatments and operations in relation to pregnancy, so much is claimed for so many cures of sterility, that I will not comment further on these cases.

The result of this treatment in the posthysterectomy cervix was most satisfactory, there were twelve of these cases, ten were cured, one now under treatment and one undoubtedly cancer, refused operation, was not treated.

A word as to the use of the expression "cured." Wherever it is used in this paper, or in the tables, it refers to the cervix only, and means that all discharge had stopped, and that the cervix was macroscopically healed, no erosions, no infected glands to be seen, that is, a clinical cure. I know of no insurance against reinfection, but see no reason why these cervices should not remain normal.

Fourteen of my cases of infected cervix were referred and I am unable to give the results. Excluding the above leaves 178 cases, 76 nullipara, 102 multipara, of these I report 107 as cured, 47 improved, 24 negative, this last figure would undoubtedly be smaller but for the uncertainty of

TABLE I

## TABULATION OF CASES OF INFECTED CERVIX TREATED BY ASPIRATORY HYPEREMIA

Total number of cases	192	Complications	
Referred, not followed	14	Retroversion	56
		Lacerations	32
Total reported	178	Prolapse	4
		Periadnexitis	17
Nulliparae	76	Fibroids	17
Multiparae	102	Syphilis	5
		Gonorrhea	22
Cured	107	Hypertension	6
Improved	47		
Negative	24		
Principal Symptoms		Time of occurrence	
Leucorrhea	125	Postpartum	20
Dysmenorrhea	31	Postabortive	13
Amenorrhea	10	Postoperative	29
Menopause	4	Postoperative	
Menorrhagia	37	After supracervical hysterectomy	13
Circulatory Stasis	39	(One Carcinoma)	
Sterility	7		
		Wearing Pessary	19

TABLE II  
RECORD OF INCIDENCE OF SUBSEQUENT PREGNANCIES

CASE NO.	PARA	PRINCIPAL SYMPTOM	COMPLICATIONS	DURATION OR NUMBER OF TREATMENTS	RESULT
44	1	Leucorrhea.	Extensive erosions.	28	Pregnant.
88	3	Sterile 8 years.	Desensus after ventral suspension.	42	Pregnant.
80	3	Leucorrhea. Stasis.	Retroversion, pessary infected cervix.	18	Normal delivery.
79	1	Leucorrhea. Sterility.	Retroversion. Infected cervix.	32	Normal delivery.
16	2	Gonorrhea. Sterile 5 years.	Pyosalpinx. Retroversion operation.	23 (Postoperative)	Normal delivery.
148	1	3 Abortions.	Desensus following ventral suspension pessary.	27	Pregnant.
71	1	Sterile 4 years. Dysmenorrhea.	Undeveloped.	28	Normal delivery.
157	2	Leucorrhea.	Postpartum infection of cervix.	13	Pregnant.
147	2	Leucorrhea. Sterile 16 years.	Fibrotic infected cervix, ovarian cyst. Operation 4th month of pregnancy.	19	Pregnant.
142	1	2 Abortions.	Double vagina. " cervix. " uterus.	12	Delivery premature child living.
33	1	Gonorrhea long standing.	Infected cervix. Salpingitis, adhesions operation.	3 years post-operative.	Normal delivery.
53	1	Dysmenorrhea.	Undeveloped reproductive organs, male type of pelvis.	2 years.	Delivery cesarean section.
5	1	Amenorrhea. Leucorrhea.	Retroversion.	36	Pregnant.
3	1	Dysmenorrhea.	Retroversion operation. Ectropion.	2 years (Postoperative)	Normal delivery.
216	2	Sterile 4 years.	Retroversion lacerations operation. Weight 210 lbs.	2 years.	Normal delivery.
28	2	Leucorrhea.	Retroversion. Infected cervix operation.	1 year.	Normal delivery.

patients and their inability to appreciate the importance of cervical conditions.

Leucorrhea was the symptom most frequently complained of, totaling 125 cases. Retroversion the most frequent complication, 56 cases or 30 per cent, which is about a normal relation.

At this point I wish to say a word of emphatic protest against curettage for the relief of leucorrhea due to infected cervical glands,—one of my patients, case No. 82, was curetted five times. Surely a sad comment on gynecologic judgment.

Of the cases of ectropion with erosion and cervical infection, number 170 was perhaps the most severe and the most extensive, with usual

curettage history; she had for eleven years been forced to wear protection against the discharge, the cervix was flattened, and presented a discharging eroded surface which bled on touch, after five months of treatment she was free from discharge and has remained so since, the menorrhagia has changed to normal periods.

Of the 178 cases of infected cervix reported the degree varied from the mildest to the severity of the case just cited.

There can be no doubt that cervical infection is much more frequent and much more important as a focal infection and a point of entry, than is generally appreciated, in fact must be reckoned with as a factor in most of our work. Intermittent aspiratory hyperemia is a method whereby we may drain the infected cervical glands and produce a temporary hyperemia and eventually, thereby eliminate a point of focal infection, also stimulate the uterine muscle to rhythmical contraction, thereby improving the uterine tone, relieving circulatory stasis, and inflammatory conditions, a chain of events greatly to be desired as they follow Nature's methods in combating pathologic conditions.

1 WEST SIXTY-FOURTH STREET.

(For discussion, see p. 327.)

## REPORT OF A CASE OF INTRACTABLE VULVAR ULCER (ESTHIOMENE) CURED BY PROTEUS VACCINES\*

BY WILLIAM P. HEALY, M.D., F.A.C.S., NEW YORK, N. Y.

THE term esthiomene is derived from the Greek word meaning to eat or corrode and in 1849, was applied in a thesis by P. C. Huguier, especially to a gnawing or corroding eruption of the vulvoanal region. He divided the cases into three clinical types—either one of which might occur alone or in combination with the others. In the first group the lesions were superficial, ambulant, serpiginous, ulcerating, healing in one place and progressing to ulceration in another place. In the second group the lesions were deeper and more destructive, perforating the tissues. In the third group the destructive features are overbalanced or replaced by edematous infiltration, hypertrophy, or even a condition resembling elephantiasis.

The disease occurs as a rule in adults, is chronic and exceedingly resistant to treatment, at times seeming to be cured but soon reappearing and progressing more rapidly. The origin of the disease is obscure and although usually regarded as due to venereal infection, has not yielded to treatment along these lines.

The patients have usually died from exhaustion or intercurrent infections.

\*Presented at a meeting of the New York Obstetrical Society, May 9, 1922.

The subjective symptoms are an intense burning sensation and extreme constant pain in the lesions, requiring the use of morphine for relief.

The following case which would seem to belong in Group I of Huguier's classification, came under my observation in September, 1919.

Mrs. M. G., age 22, married eight months.

The patient's mother died at forty-one years of cancer of the left cheek, otherwise the family history is entirely negative for cancer, tuberculosis or syphilis. The woman's general health was always excellent until the onset of present illness. Her menstruation was normal except for severe backache during the period. At time of admission, patient was about six months pregnant. Her chief complaint was due to ulcer of the vulva, giving intense pain. The present illness began in 1915 with the development of a small blister, the size of a pinhead on the left labium majus, which caused a burning sensation and two days after its appearance broke open and discharged a small amount of serum. It then began to pain a great deal, especially when irritated by urine, and a physician was consulted who made an examination of the blood and urine, which were negative, and treated the lesion with iodine and salves. It soon healed and remained so for nearly six months, which was the longest period of quiescence since the onset. It then broke down again and under similar local treatment was soon healed, but thereafter would reappear at intervals of from one week to a month, slowly healing under local treatment and not always reappearing in the same place.

The patient married in December, 1918, and thereafter as a result of irritation from intercourse and the urine, the ulcer rarely healed for more than a few days at a time. During the first few months of her marriage, the patient was anesthetized on four different occasions, and the ulcers were cauterized without success. Silver nitrate applications distinctly aggravated the lesion and added to the patient's distress. The chief symptom throughout has been intense pain and burning in the ulcers and the adjacent tissues.

In August, 1919, despite a negative blood Wassermann test, a clinical diagnosis of syphilis was made, and the patient was given six intravenous injections of a French salvarsan solution without influencing the lesion.

The patient conceived two months after her marriage and there seemed to be no doubt that the congestion of the tissues of the vulva, as a result of pregnancy, was a factor in increasing the spread of the disease. A local examination of the patient at this time (Sept., 1919) showed a marked lividity of the tissues of the vulva with a very moderate induration and edema of the subcutaneous structures. About the middle of the left labium majus there was a deep transverse scar, due to the cauterization. The right labium majus and adjoining surface of the thigh were covered by several irregular, superficial ulcers, which tended to coalesce and extend down the inner side of the right buttock toward the anus. The edges of the ulcers were slightly undermined in places and were not especially firm, the base was yellowish and bled easily, and the raw surfaces were exceedingly sensitive to the slightest touch.

The plan of treatment followed at first was extreme cleanliness and constant protection of the lesion from external irritation, and for a few days the lesion seemed to heal along the upper margins but continued to spread below. The patient was then taken to the operating room and the lesion excised, and the raw surface thoroughly cauterized. This was done on October 10, 1919. A microscopic report on this tissue was:—"Infected skin ulcer with necrosis." There was no improvement in the patient's condition following this treatment and thereafter for a period of one month the local treatment was carried out by means



of wet dressings of various solutions; such as boracic acid, soda bicarbonate, tincture of myrrh, hydrogen peroxide, Dakin's solution, neosalvarsan locally, and ointments of various kinds, without avail. The condition of the patient was pitiable and precarious, and the pain of the lesion was constant and most intense. She was receiving a grain or more of morphine sulphate daily, hypodermatically, and 5 per cent cocaine ointment was being applied to the ulcers. The lesion gradually spread involving the lower portion of the vagina and nymphae, causing a slough of the perineum, extending across to the left buttock and around the



Fig. 1.

left side of the anus. It was feared that the fetus would succumb to the morphine and codeine, and as even a dead fetus could be delivered with difficulty and considerable risk to the mother through a diseased vulva, it was decided to do a cesarean section, November 7, 1919, four weeks before term, in the hope of saving the baby which seemed to be well developed at that time. This operation was done on that date and a male child weighing 6 lbs. and  $\frac{1}{2}$  oz was extracted.

The baby breathed spontaneously and seemed to be in every respect a normal infant, free from any evidence of congenital syphilis. The patient's conval-

escence was normal despite an infected abdominal incision. The ulcers seemed to improve during the puerperium. During this time two x-ray treatments a week were given with the hope of stimulating the tissues to heal. After a preliminary improvement however, it was evident that no definite headway was being made and that the patient was really gradually losing ground.

In January, 1920, a transfusion of 500 c.c. of blood was given and a day or two later the entire ulcerating area was completely excised and the raw surfaces closed with silkworm gut sutures. The result was apparently very successful, and the lesion appeared to be cured for a short time. It soon recurred, however, and spread rapidly, and in March, 1920, another excision—more extensive than the preceding—was carried out, and a plastic operation to cover in the raw areas was done at the same time. This operation also appeared to be a success, the entire surface area was healed. In June 1920, however, immediately in the center of the transplanted area there was a small recurrence. This was promptly excised. Late in July the lesion broke out again.

The pathologist's report on the tissues removed follows:—

“Specimen consists of excised vulvar ulcers and the subcutaneous tissues sur-

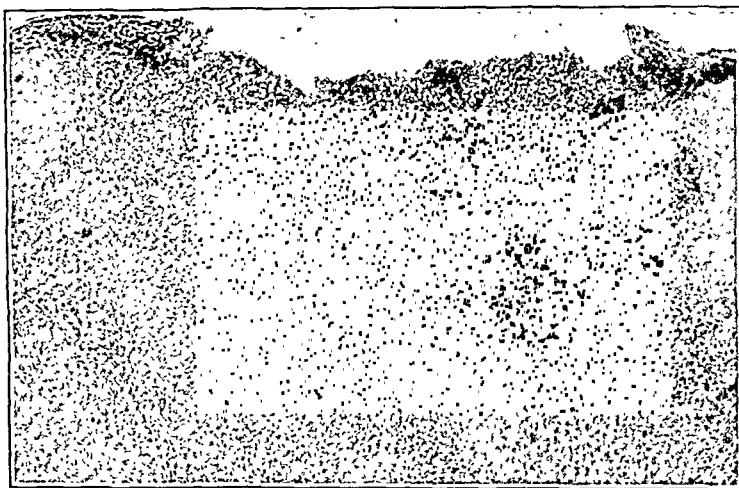


Fig. 2.

rounding them. There is some ingrowth of epithelium into the bed of the ulcer, which is grayish red, and somewhat necrotic. The edges of the ulcers are not undermined and the surface epithelium grows down into the bed of the ulcer. Sections were taken from various portions of the ulcers, and all seemed to show the same pathological condition.

“The stratified squamous epithelium of the skin, where it is intact, appears normal, containing both hair follicles and sebaceous glands. Following the surface of the skin area one suddenly comes upon an area of ulceration where the entire dermis is destroyed. This is a healing ulcer as the floor is made up to quite a depth of well organized tissue, with cellular infiltration and proliferation of the blood spaces. The depth to which the ulceration has extended, as indicated by the lowest point at which the granulation tissue begins, is on the superficial perineal muscles. These muscles and the fatty and connective tissues around them are infiltrated especially around the blood spaces, with foci of small round cells and polymorphs. There is no extensive necrosis in the lesion at present. Sections stained with methylene blue have been made in an attempt to bring

out the nature of the bacteria within the ulceration. Only cocci are seen and these are probably staphylococci and streptococci of secondary infection. No specific organism has been found by the staining methods employed. The epithelium of the ulcer edge shows only a slight tendency toward proliferation and ingrowth.

"The failure of the epithelium to grow over the granulation tissue cannot be due to the poor blood supply, as these sections show the presence of numerous blood spaces. However, as a theoretical cause for the lack of healing power in the tissues one might suppose that a specific organism—if it is such—that causes such a deep and widespread ulceration and loss of tissue, may well be able, when still present in the tissues to destroy the new tissue as it is formed, or at least to retard its normal repair; and that the granulation tissue having more resistance than the new growth of epithelium, proceeds at a more rapid pace, while the epithelial edge seems to be almost at a standstill."

Just after the operation while the excised tissue was still sterile, cultures were made aerobically and anaerobically by placing pieces of tissue in the media. A short chain nonhemolytic streptococcus was grown in both the aerobic and anaerobic media. These were obtained in pure culture. A dilution of 1 to 100 was made in normal saline and 0.5 c.c. of this solution injected into the skin of a guinea pig and 0.2 c.c. into the skin of a mouse. Both animals were alive and well without any appearance of a lesion at the site of injection, a week later. Then a dilution of 1 to 10 was made from the pure culture and 1 c.c. of this solution was injected into the skin of a guinea pig and 0.5 c.c. into the skin of a mouse. The mouse died 24 hours and the guinea pig 72 hours, after the injection. Autopsy revealed nothing in either case at the site of the injection or in other organs. The culture died out before further injections were made. The opinion of the bacteriologist is that these organisms are not in any way the specific cause of the lesion, but simply secondary contamination of the ulcerated areas.

In September, 1920, smears and cultures were made from the surfaces of the ulcer by Dr. Thomas S. Winslow. Practically a pure culture of proteus was until about the first of May, 1921, when there was a recurrence. Cultures were made and again the proteus was the predominating organism. At the suggestion of Dr. Winslow a proteus vaccine was made and on the first of October the administration of this vaccine was begun, and was kept up at intervals of 3 to 4 days, starting with a dose of 50,000,000 and increasing until the patient was receiving 500,000,000 at each dose. This treatment was continued without interruption for three months until the patient had received 30 doses of the vaccine.

Within ten days after the beginning of the treatment the pain left the ulcers and they began to heal. In one month they had completely disappeared. The improvement in the patient's general health was also remarkable, with the disappearance of the local lesion and the cessation in the administration of codeine and the use of cocaine ointments. The lesion remained healed from November, 1920, until about the first of May, 1921, when there was a recurrence. Cultures were promptly made from the lesion by Dr. Winslow, who again obtained the proteus but in combination with a bacillus lactis aerogenes and a fungus.

A vaccine of the proteus was made and again administered and the lesion which was showing a tendency to spread, rapidly and promptly responded to the administration of the vaccine, and in six weeks had entirely disappeared. The patient has, up to the present time remained free from any recurrence.

The manner of development of the lesion was always the same—the patient would experience a burning sensation in an area of the vulva and within 24 hours a minute herpetic vesicle would appear at this point, gradually enlarging to about 1/16 or 1/8 of an inch in diameter, and would then break down, leaving a small raw surface. The lesion all the time resembled a simple herpes. After

the appearance of the ulceration the pain would become much more severe, and the patient would show distinct constitutional depression at this time. The ulcer would then gradually enlarge, and the epithelial tissue appear to slowly dissolve and melt away—the lesion growing always superficially and in a serpiginous manner. After a time there would be a tendency to healing in some areas but this was never complete.

The proteus, in pure culture or in association with other organisms, in pathologic conditions has been isolated from time to time by various investigators since 1889. While this organism is ordinarily regarded as nonpathogenic there is ample evidence, according to Wenner and Rettger, to show that it may assume a pathogenic rôle, and thus occupy a position analogous to the pyogenic micrococci.

#### CONCLUSION

There would seem to be no doubt that this case corresponds to the lesion first described by Huguier in 1849. There would also seem to be no doubt that in this instance the persistence of the lesion was due to the presence of the proteus bacillus, which through its toxins or in some other manner brought about a solution and destruction of the tissues, which persisted despite all local medical and surgical measures until the proteus vaccine was administered. This brought about prompt relief from pain and the rapid healing of the raw surfaces.

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525 PARK AVENUE.

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## A NEW SUTURE HOLDER FOR VAGINAL PLASTIC OPERATIONS\*

BY HERMAN GRAD, M.D., F.A.C.S., NEW YORK CITY

**I**N plastic operations on the female genitalia or bladder it is essential to place a large number of sutures in position before they are finally tied. The usual procedure is to place the suture in position and with a clamp hold the free end of each individual stitch. If a large number of stitches are taken the number of clamps necessarily accumulates and cause considerable annoyance to the operator. Furthermore, the clamps become entangled with each other and there is loss of time in separating them when the sutures are finally to be tied.

In trying to overcome this difficulty, I had several devices constructed for the purpose of holding the sutures apart before they are tied, and finally settled down to the use of the holder shown in the picture. As depicted here the suture holder has each stitch on a separate peg and thus the sutures are kept from becoming entangled with each other.

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\*Presented at a Meeting of the New York Obstetrical Society, May 9, 1922.

The device consists of two vertical parallel bars attached to a horizontal bar upon which they slide. On the vertical bars are found small buttons, upon which the suture and clamp can be hung until the surgeon is ready to tie them.

The picture is really self-explanatory.

The contrivance has been used by me for the past two years with a great deal of satisfaction, and I am sure that it has saved me a good deal of time in operations. It will aid the surgeon in plastic operations, as it helps to keep the sutures separated from each other, and the suture really remains where the surgeon places it, and

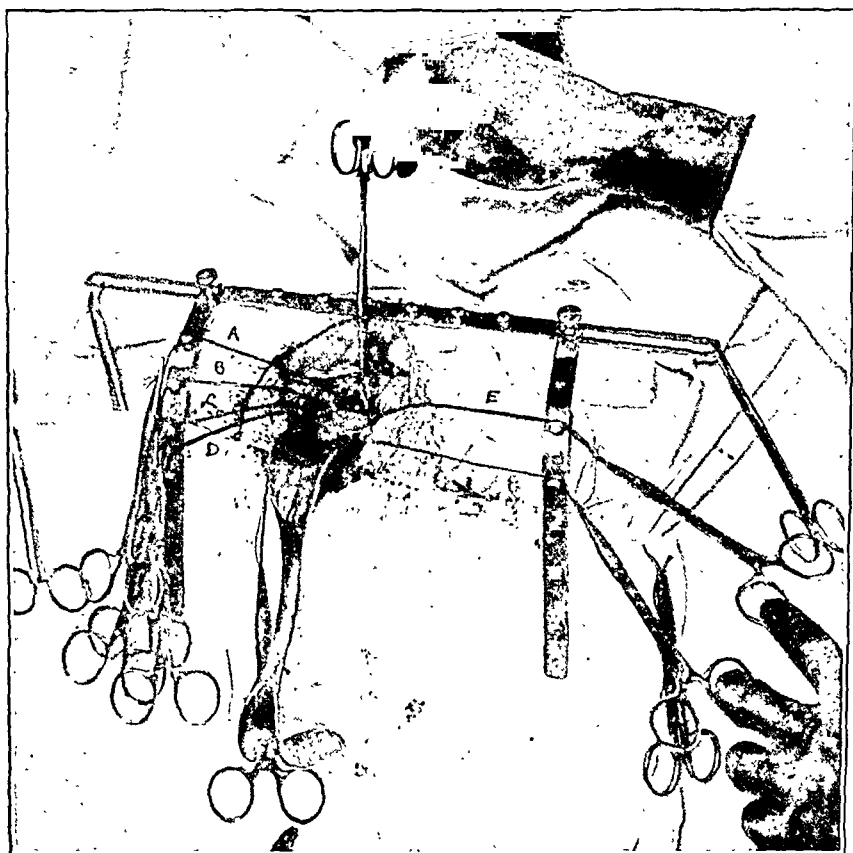


Fig. 1.—Grad suture holder in position, showing manner in which clamps and sutures are kept away from the operative field.

is readily available when he is ready to tie. The clamps holding the end of the suture are out of the field of operation at all times, which is a great advantage.

Fig. 1 shows the suture holder in position and held by two towel clamps at either end of the horizontal bar. A sterile towel is firmly fastened over the anus, attached by a suture through the skin over the perineum. The various sutures, *A*, *B*, *C*, *D*, and *E*, are kept apart by the buttons which are arranged in rows. The weight of the clamp on the free end of the suture holds it in place.

The device may be procured from the Smith Bone Clamp Co., Watertown, N. Y.

40 E. FORTY-FIRST STREET.

# X-RAY AND RADIUM IN CONSERVATIVE GYNECOLOGY

BY ARTHUR E. HERTZLER, M.D., HALSTEAD, KANSAS

*From the Halstead Hospital*

TO those surgeons who have lived through the terrible years of the wholesale castration of women, the present trend of the development of the actinic ray therapy must be regarded with a feeling akin to consternation. On one day I recently had three experiences which awakened my gravest apprehension. These were as follows: A patient came to me, a school teacher, age thirty-three, with the complaint of pain in the pelvis and flooding. A fibroid was diagnosticated by her surgeon and operation advised. She consulted a roentgenologist who assured her that he could relieve her of her trouble. Radium and x-ray were used. The hemorrhages ceased and the pelvic discomfort lessened and she was hopeful. The hemorrhages ceased altogether and she was apprehensive of a premature menopause. Then came a series of nervous phenomena which she attributed to worry over the absence of her menses. The symptoms were typical of the castration menopause.

She was followed by a woman in her early thirties who, following the care of a sick parent, had a prolonged and painful menstruation. She consulted her physician who after the failure of simple remedies advised x-ray and radium. The metrorrhagia ceased and in three months the menses also ceased. She divined the import and consulted her physician. Would the menses return? He did not know. She came to me with the same question. I did not have a better answer. Could anything be done in a surgical way to bring them back? Nothing. Her lamentations were pitiful. She had devoted her life to an ailing parent, whose death now made possible a long deferred marriage which now must remain childless.

A patient, aged forty-five had had a pelvic tumor for some years attended by an increasing hemorrhage. Operation was advised but she was told she could be cured by radium. She was treated by one of our most competent radiologists. The hemorrhages ceased but the tumor filled the pelvis. She asked if there was any danger of the tumor becoming cancerous. Nobody knows. I could not even be sure if it was a myoma, or an ovarian sarcoma, so snugly did it fill the pelvis.

I chanced to read the same day, an article written in 1872, an account of the then new treatment of myoma. It stated that by the removal of the ovaries the hemorrhages would cease and sometimes the tumor shrank. Then I read in the latest number of a well-known journal an article bearing the heading of this paper, by one of our most prominent gynecologists. It said that by means of radium we could make the hemorrhages stop, sometimes the tumor shrank, using the very same

words of the all too famous Massey (?). Neither article mentioned the suffering of the artificial menopause.

If there is one operation in surgery now on a sound basis, it is the surgical treatment of myomas of the uterus. The mortality after hysterectomy for myomas is the mortality of complications. Many operators have had runs of a hundred or more cases without a death. A good operator, if he be not too lazy, can remove the tumor by conservative myomectomy and preserve for his patient a menstruating organ. The uterus is more than a reproductive organ, it is also the balance wheel of civilization. There is no zoological classification that has reserved a place for the castrated woman. No method of treatment that brings this state in its wake can have a place in modern therapeutics.

No procedure that does not give the surgeon an opportunity to determine the pathology of the tumor is sound surgical practice. Three or four per cent of myomas become malignant. The operator who has an operative mortality so high as this is not a good surgeon. He is doing things he ought not to do. It is argued that one should confine the radium treatment only to those patients whose myomas are uncomplicated. Expert gynecologists with an extensive clinical experience cannot diagnosticate the various complications, to which myomas are liable, with infallibility. Even they find unsuspected changes in the tumors which are revealed only on section. Early sarcomatous degeneration, hemorrhagic myomas and early carcinomas of the fundus are beyond the ken of physical examination. The x-ray operator, untutored in pathology, cannot hope to make the niceties of distinction the selecting of the uncomplicated cases require. At best he can control but one symptom: hemorrhage.

The effect of the rays on the tumor itself is problematic. Some shrinking sometimes occurs but complete disappearance is the exception. It is not uncommon to see sarcomas develop in myomas which have ceased to bleed because of the natural menopause and we are not sure but that the same thing may follow the amenorrhea due to radiation.

It is said the patient should be examined first by a competent gynecologist in order to determine if the myoma is complicated. Such an arrangement, like the purification of politics, is, in the language of a famous Kansan, an iridescent dream. Roentgenologists as a class are a "cocky" lot and seldom require consultation. This is the natural mental attitude of the specialist in a narrow field and roentgenologists can escape it only by broadening the field of their knowledge. Experience already has proved that they as a rule, do not inquire further than to know that the patient bleeds, a symptom they are able to control.

Even more undesirable is the use of radiation in the metrorrhagia of adolescence. In these patients the nervous disturbances from the loss of ovarian function is most severe. It is only slightly less so in

mature nonparous women. These cases can be managed by less radical means. We now know that the majority of these are endocrine disorders and are amenable to other treatment. Sterilization is never warranted.

If we cannot trust the competent roentgenologist to properly select the cases, and trained gynecologists realize full well they are not able to do so, what shall we say of those possessed of radium who are neither trained radiologists nor surgeons? It is not right to condemn a method because it has fallen into hands wholly incompetent to even approximately select the cases most suitable to its use. Nevertheless, patients are being treated by such as these. Many of the unfortunate patients I have seen have been dealt with by men the best of their class. We cannot expect more of the incompetent. Yet the incompetent cite the opinion of prominent gynecologists as a warrant for treating these patients with radium.

We now know that when a uterus bleeds abnormally we can find out why it bleeds. No man can tell by physical examination alone why it does so. When the cause has been found it may be gently removed and sent to the laboratory and there studied in its ultimate detail. It is only by pursuing this method of study that we may hope to advance and permit the rising generation of surgeons to maintain the present level of efficiency. If we treat bleeding uteri by radium the next generation of gynecologists, like the roentgenologists, will know only two kinds of uteri—those that bleed and those that do not. The clinical diagnosis of uterine hemorrhages, like the clinical diagnosis of syphilis, will go into the discard. We will become a profession of vulva inspectors just as we are in danger of becoming one of Wassermann readers.

The management of myomas is one of the most brilliant achievements of surgery and all this knowledge should not be cast into the discard because it has been discovered that hemorrhage may be stopped by radium. It does not cure the disease, it but controls one of its most obvious symptoms. The surgical management of myomas is based on sound knowledge of pathology and the results are guaranteed by a vast clinical experience.

The use of actinic rays is not a proper treatment of myoma. It controls one symptom only. We know nothing of the ultimate fate of the tumor left behind. The Massey method of castration was unsatisfactory and the profession labored for fifty years to get away from it. Let the rising profession take this word from one who has lived through one period of promiscuous castration; there is nothing more pitiable than the castrated female who does not understand the cause of her multitudinous complaints; nothing more heart rending than the sufferer who understands the cause and appreciates its meaning; and nothing more damnable in the eye of the surgeon who has been through it all and knows it is all wholly unnecessary. In the language of Olshausen, "I have seen enough."



# Society Transactions

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## AMERICAN GYNECOLOGICAL SOCIETY

### FORTY-SEVENTH ANNUAL MEETING

WASHINGTON, D. C., MAY 1, 2, 3, 1923

GEORGE GRAY WARD, JR., PRESIDENT; ARTHUR H. CURTIS, SECRETARY

DR. FRANKLIN H. MARTIN of Chicago, Ill., read a paper entitled **Further Progress in the Study of Ovarian Transplantation.**

According to Bell, the chief indication for transplantation is a serious pelvis infection, particularly that due to the gonococcus. In 98 cases only five grafts were made in the absence of pelvic infection. The operation is contraindicated in women over 42, in women sexually inactive, and in all cases in which conservation is possible. It should be looked upon as a measure of necessity, which can never be weighed in the balance against the preservation of the natural connections of the normal ovary.

In 230 grafts performed by Tuffier, the object of transplantation was: (1) to conserve or reestablish the physiological state and menstruation after removal of the ovaries and the tubes when the uterus has been preserved. (2) To ameliorate the symptoms due to complications following the removal of the uterus and of the ovaries. Sixty of the transplantations were performed after total or supravaginal hysterectomy, 156 after oöphorectomy with total conservation of the uterus, and four after oöphorectomy and subtotal hysterectomy. Four patients of the 230, or 1.8 per cent, died from abdominal infection due to the original disease.

If the uterus is not removed, ovarian transplantation may retain the utero-ovarian harmony for a time, but Graves has come to the conclusion that the uterus should be extirpated when both ovaries have been removed as an isolated uterus is likely to cause trouble which implantation of the ovaries cannot obviate. Unterberger states that the climacteric appears earlier than normal in cases in which the ovaries have been transplanted, but the menopause occurs more normally than in cases of operative castration. The experience of Graves, Tuffier, Bailey and Chalfont indicate that the retention of ovarian tissue *in situ* or by transplantation after removal of the uterus, is of little physiologic value.

Bell makes the following statements regarding site and technic: (a) All grafts in the human subject must be autoplasmic. (b) After the ovaries have been removed the ovarian tissue from which the graft is cut should be dropped to the bottom of the pouch of Douglas, where it will be kept warm and moist until the end of the operation when it is required for grafting. (c) When possible, healthy ovarian tissue, which may include all the elements of the organ should be used. This should be criss-crossed with a sharp knife into adherent fragments, after the densest tunica albuginea has been removed, to favor rapid vascularization of the grafted tissue. (d) The graft, provided there is no suppurative infection of the ovary, may be placed in the rectus muscle before the laparotomy wound is closed. I have also implanted the graft in the uterus or what was left of the organ. It is

most important that the graft should be placed in a vascular site, yet it should not be surrounded with blood. Too much care cannot be taken in placing the graft among the muscle fibers. (e) If the ovaries are badly infected and more or less completely converted into the walls of abscess cavities, whatever tissue can be removed should be implanted in the internal oblique muscles alongside the drainage tube, which in such circumstances is passed through a stab wound well away from the central incision into the pelvis. I have, however, never seen an infected graft slough. Moreover in several such cases, menstruation has subsequently occurred.

Out of 10 intraepiploic autografts, 8 cases were followed and menstruation had occurred in all (Mauclaire). Unterberger reports successful results in 19 cases, menstruation appearing from two to seven months after the operation and being prolonged for five years in the younger women. The following conclusions are reached by Unterberger: (a) The ovaries can be very reliably grafted by autoplasic procedures, in the human female. (b) Fragmentary transplantation furnishes better results than transplantation of the whole ovary. As the site of transplantation in laparotomy cases, the anterior abdominal wall between the rectus and the anterior sheath of the rectus is recommended. (b) Even up to the end of five years after autoplasic transplantation, regular menstrual periods are observed. (e) Autoplasic grafting is indicated: (1) in the presence of benign bilateral ovarian tumors; (2) in grave bilateral disease or suppuration of the adnexa.

The question of inheritance in the case of the homograft is still open, as is also the question as to whether blood from the donor should be injected into the donee as a preliminary to the operation. Out of five cases of intraepiploic homografts, two had been followed and the results seemed permanent (Mauclaire). Schiebele reports successful results in a case in which a human ovary was grafted to either side of the broad ligament. Unterberger believes that homoplasic operations are indicated only in the presence of atrophy or infantilism of the genitals with preservation of the ovaries of the recipient. Cramer in seven homoplasic cases reports that the menses were reestablished in three, severe menopausal symptoms disappeared in two cases, while in two cases of castration results were negative because of anaphylaxis. Homograft alone was performed by Tuffier in 20 cases. In six cases, homografts and autografts were combined.

Graves maintains that the uteroovarian harmony may be restored by heteroplasic transplantation, but this operation has not been universally successful, as heteroplasic grafts do not always take into account the physiologic antagonism of blood and tissue that exists between different individuals and different species.

Of 73 cases in which the ovary was transplanted with preservation of the uterus and in which from four months to twelve years have followed the operation, menstruation has been regular in 56 (76.71 per cent). The youngest patient was 18 and the oldest 41 years of age. The ages of the other patients ranged from 18 to 40 years. Menstruation usually returns five to seven months after the transplantation, if it appears earlier, it is due, Tuffier believes, to a section of ovary left at operation.

After finding invaginations of the epithelial layer and cells closely resembling oöcytes, Athias has concluded that in ovarian transplantation an ovular neoformation can be produced at the cost of invagination of the superficial epithelium. Long and Evans found no actual evidence of a true ovulation, but there was an apparent rhythmic production of corpora lutea from unbroken follicles, as corpora lutea of several ages were demonstrated in sections.

My first report was made in 1903; my second report in 1908; my third in 1911;

my fourth in 1915; my fifth in 1917. As in this, my sixth report, I attempted each time to bring the literature up to date, and to furnish a complete bibliography. As more evidence is accumulated from the literature, the claims of the earlier enthusiasts seem to become less and less substantial. The one most hopeful feature I am able to glean from the mass of more or less loosely recorded evidence is that the clinical records dealing with transplantation in the human show that while autotransplants give some evidence of success, homotransplants and heterotransplants give practically none at all. On the other hand, definite evidence of success is recorded as the result of carefully conducted experiments on animals in which matters of selection of appropriate material and proper technic are more controllable than in dealing with the human. May we hope that this fact and a more careful study of the subject from a scientific and experimental standpoint will reverse the unsatisfactory showing?

The opinions expressed in the writings on this subject in 1918, 1919, 1920 and 1921, may be summarized as follows:

1. Clinically, there is very little to encourage one to believe that transplantation of ovaries as practiced up to the present time has more than speculative value as a surgical procedure.

2. There is evidence that autotransplants are of some value in deferring the symptoms of the menopause and delaying the cessation of menstruation. It is difficult, however, not to attribute some of this evidence to suggestive therapeutics or to unattached ovarian tissue left *in situ*.

3. There is practically no convincing evidence that homotransplants have been successful in the human female.

4. There is no evidence that a heterotransplant has been successful where the human female has been the recipient.

5. There is some encouraging evidence recorded in experimental animal surgery that not only autotransplants, but homotransplants and even heterotransplants have been successful and the sexual function of the castrated animal maintained.

6. The technic followed by the various operators on human females in too many instances seems unsurgical and too often is incompletely and loosely recorded, leaving the reader with the impression that the conclusions derived from such work must be unreliable.

7. There is, however, encouraging evidence in all of this endeavor to lead one to hope that the subject will be pursued experimentally, especially for the purpose of devising a rational and simple technic, based on the work of the serologists, the endocrinologists, the hematologists, and the clinical surgeon.

## DISCUSSION

DR. C. JEFF MILLER, NEW ORLEANS, LOUISIANA.—About ten years ago I published a report of 20 cases of ovarian transplantation, which I was able to follow in a general way, having a fairly good record of about 15 cases. As Dr. Martin has said, the results have been somewhat disappointing, especially in view of the fact that ovarian grafts can be so readily transplanted. It has been found that in about 70 per cent of the cases, grafts will grow promptly, and usually at the end of about four months, menstruation will be reestablished. The period of four months is so usual, that I suspect that a piece of the ovary has been left at the normal site, if menstruation returns under that time.

The length of time that menstruation will continue after a transplantation is very uncertain. In three of the above mentioned cases, menstruation continued for six months, then stopped suddenly, and never recurred again. The longest case in my series continued to menstruate normally for eight years.

The fate of ovarian grafts that do not function is definitely determined. They are gradually absorbed and practically disappear. In some cases, however, they undergo cystic changes. Three years ago I removed a graft, which had been in place for one year. A cyst had developed, which contained three ounces of fluid, was very sensitive on pressure, and caused the patient considerable trouble. One interesting feature was that she developed a metrorrhagia, which continued from time to time until the graft was removed.

The location of the graft is of some importance. It was formerly thought essential to place it in contact with peritoneum, but this is no longer found necessary. The easiest method is simply to slip segments of the ovary into pockets in the rectus muscle, as the abdominal incision is being closed. It is necessary that the field be made perfectly dry, otherwise oozing and blood clots may cause destruction of the graft. It does not appear to make any particular difference whether the part of the ovary used is normal or slightly sclerotic, as I have used portions of an ovary in various stages of cystic and sclerotic changes, and found that the graft grew and functioned as promptly as portions of the normal ovary.

I have found that it is necessary to use as much as one-third of the ovary. Tuffier, who has had unusual experience in ovarian grafting, insists that less than one-third of the ovary will not function as desired. However, I have frequently used less than this amount, and delayed an artificial menopause for a time, which was a distinct advantage to the patient. The age of the patient is also important. In three of my cases, the patients were slightly over 40 years of age, and in none of these was menstruation reestablished. I find that this has also been the experience of Tuffier, who states that in 26 cases over forty years of age, grafts did not function, and none of his series menstruated. I concur in his belief, that it is useless to try transplantation after the fortieth year of age. This is one point in connection with ovarian grafting, which I wish to especially emphasize.

We have all had the annoying experience of leaving ovaries when dealing with pelvic infections and the patients complained of severe dysmenorrhea afterward. I have never noted dysmenorrhea in one of these cases, where menstruation was reestablished after ovarian transplantation. As a rule, they menstruate regularly, but the flow is frequently less than the normal amount.

The ease with which transplantation can be accomplished, should prompt us to bear it in mind, when it becomes necessary to sacrifice ovaries, for even though it preserves menstruation for a limited time, it often prevents a sudden menopause, with its annoying phenomena.

DR. ARTHUR H. CURTIS, CHICAGO.—Twelve years ago Dr. George Dick and I transplanted ovaries, using both homotransplants and autotransplants, in some fifty odd rabbits. We were able to obtain satisfactory transplants in only three instances, and one of these was doubtful. We early got the impression that this work was unsatisfactory; hence Dr. Watkins and I have never given it a thorough trial on our patients. We are, however, much interested in the results obtained by Dr. Miller thus far.

DR. J. WESLEY BOVÉE, WASHINGTON, D. C.—My interest in this subject had been flagging in the last few years until Bell came to this country and showed me his method of implanting a portion of the ovary into the left rectus muscle. I saw at once that this was quite different from the method I had been pursuing previously. He takes a very thin section of the ovary from very near the hilum, and by gridiron incisions, he cuts nearly through the thickness of the structure with each stroke. This he feels increases the probability of an early vascularization and therefore minimizes the percentage of sloughs. I must say, in every instance since then I have followed this plan, about twelve times. I have seen no

symptom that could be directed toward the point of the graft in the left rectus muscle.

DR. HERMANN J. BOLDT, NEW YORK CITY.—I would like to ask Dr. Martin what he thinks of the case reported by Dr. Robert T. Morris, in which he transplanted a portion of an ovary from one patient to another, the first patient having had the ovaries removed, and menstruation having ceased for a long time, 2 years, I believe, and that patient subsequently became pregnant. That instance has been a mystery to me. I have to take Dr. Morris' word for his results, but I do know positively that the operation was done, because it was performed in my presence and my patient furnished the part of the ovary. The history of his patient was placed at my disposal in the hospital. Dr. Morris asked me subsequently to try and get the woman from whom the transplant was taken to come back and see if the child resembled her. The transplant was made in the broad ligament.

DR. MARTIN.—You say that the patient receiving the transplant had not menstruated for a considerable time.

DR. BOLDT.—Yes.

DR. MARTIN (closing).—I have nothing further to say. I certainly cannot answer the question of Dr. Boldt, and I have no theory to propose in regard to it.

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DR. JOHN OSBORN POLAK, of Brooklyn, N. Y., read a paper entitled **What Is the Relation of Hypertension to Fibroid Disease of the Uterus?** (For original article see p. 227.)

#### DISCUSSION

DR. J. WESLEY BOVÉE, WASHINGTON, D. C.—Blood pressure change is due to so many etiologic factors that I have long since concluded I was not competent to trace its origin, and I can only take it from a practical standpoint. We know that there are many cases, like endocrine dysfunction, enlarged thyroid, which influence very markedly blood pressure.

I do not know just what Dr. Polak means by blood pressure, whether he means systolic blood pressure, diastolic pressure, or pulse pressure. Here in Washington we have been paying attention to all three, systolic, diastolic and pulse pressure, and I assume from his figures that Dr. Polak has been speaking of the systolic blood pressure.

The menopause seems to be very commonly associated with elevated blood pressure. In a good many cases of fibroid tumors of the uterus I have failed to come to the conclusion that there was any relation between blood pressure and the presence of the fibroid tumor. I think there might be in large fibroid tumors an increase in blood pressure, but I am not even convinced that such is the case. In recent years we have had such a falling off in the number of cases of large fibroids, that our study in that direction is incomplete.

There is one special feature brought up that is interesting to me, and that is the effect of radium on the blood pressure in the treatment of these fibroid tumors. It should make us hesitate to apply radium in the treatment of fibroid tumors of the uterus that are associated with high blood pressure.

DR. CURTIS F. BURNAM, BALTIMORE, MARYLAND.—I am much interested in what Dr. Polak has had to say about high blood pressure in relation to uterine fibroids. It is an old story, dating back to the early days of gynecology, that

uterine fibroid is associated with heart disease. This belief long antedated our modern clinical methods of determining high blood pressure.

Has Dr. Polak compared nonfibroid cases of the same age with fibroid cases in reference to high blood pressure? Men, as well as women, will show on the average with each decade, increased blood pressures. This is recognized by all the insurance companies in considering applicants for insurance. I have repeatedly been consulted as to the advisability of producing an artificial menopause in cases of high blood pressure. These patients usually show much higher blood pressure during the menstrual periods than at other times, and it was felt that if the menopause could be produced they would be relieved of these exacerbations. Perhaps a dozen patients treated yielded no result in the way of reduction of blood pressure and we, therefore, have discontinued the treatment.

Idiopathic high blood pressure is often independent of kidney diseases. It is usually assumed to be due to a sclerosis of the terminal arterioles. This may be the case in the terminal stages of high blood pressure, but certainly cannot be the case in the early stages. Heavy radiation through the abdomen or through the back directly on the adrenals will produce a fall in the high blood pressure case, which may persist for several weeks, but which I do not believe is of any permanent benefit.

Dr. Samuel Crowe has recently been doing some very interesting work on the implantation of radium emanation points in the adrenals of dogs, and in these cases, where there is extensive destruction of adrenal tissue, there is invariably a great fall in the blood pressure.

DR. CURTIS.—How long did you follow the blood pressure in these cases after radiation?

DR. BURNAM.—For several months.

DR. HOWARD A. KELLY, BALTIMORE, MARYLAND.—In these days of errant Conan Doyles and the calling up of spirits, it is refreshing to call up those good old spirits, Schroeder and Hofmeier of the eighties. The latter had the notion that fibroid tumors of the uterus were intimately associated with high blood pressure and with degenerative changes in the heart, and that this accounted for sundry deaths in the more advanced fibroid cases following operation. On the other hand, by an easy logical process it was urged that earlier operations on these cases ought to be performed to avoid such sequelae. On purely clinical grounds I have never been able to determine that fibroid tumors had any relation to blood pressure or heart disease. One of the assumptions naturally was that large fibroid tumors would so press on the lower abdominal vessels as to interfere with the circulation and back the blood up in the heart, in that way acting as a mechanical positive factor in raising pressure. This was, therefore, one of the reasons for urging early operation on these tumors.

I wish Dr. Polak had followed the radium cases for a longer period. Radium causes great thickening of the arterial coats in the tissue radiated, and that suggests a reaction for a time, at least, on part of the vascular system at large. However, after several months one might well expect a return to the normal. After all, this elevation of blood pressure was but moderate, and not within the danger zone.

DR. POLAK (closing).—In reference to Dr. Bovée's remarks on blood pressure, I would say we took the pulse pressure of all of these cases, both at rest and after exercise. We did not bring this point out in the charts because it made the charts too complicated. With reference to the clinical value of systolic, diastolic and pulse pressures, we have learned to accept the pulse pressure as the real index of the cardiac muscle strength, of course excluding aortic regurgitation, where we get such

a tremendous pulse pressure. The point Dr. Burnam made that many of these cases will not stand metabolic readings is well taken, for our study of the cardiac and renal functions fails to explain these high pressures. We have shown the incidence of age and kidney complications, not as a cause of blood pressure, but as an incidence in the blood pressure study.

Many of these cases fall in the class of what is termed "essential hypertension." This we do not understand, and internists do not seem to know much more about it. The average internist talks a good deal about it, but when you ask him what he is going to do for essential hypertension, he simply says it is hypertension, and that is final.

In regard to the effect of radium, I will say to Dr. Kelly that there was one patient who presented a pressure of 160. Radium was given after more or less continuous uterine hemorrhage, and three weeks after she left the hospital, her pressure was 230. She then had a hemorrhage into the retina, and the optic nerve was destroyed. This rise was much greater than in any of the cases where operation had been done. I will admit, however, that this patient was selected for radium because she had high blood pressure, cardiac disease and some evidence of disease of the kidney.

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DR. JOHN G. CLARK, Philadelphia, Pennsylvania, read a paper entitled  
**A Comparative Study of Two Series of Gall Bladder Lesions, of**  
 which the following is an abstract.

At a previous meeting of the American Gynecological Society I reported a series of 159 cases of cholelithiasis. In this series the proportion of cholecystostomies to cholecystectomies was in the approximate ratio of two to one. Since then 159 additional cases have been operated upon, and the relationship between these operations has been almost exactly reversed. One might accredit this revolution to a national change in surgical modes. As we analyzed our unsatisfactory results in this first series, the errors were ascribed to two sources, first, a failure to remove a number of irretrievably diseased gall bladders, and second, to the postoperative sequelae, which may result from adhesions around the tract of any intraperitoneal drain. Unquestionably too, we were influenced by the misleading thought that a cholecystostomy was a less perilous, and therefore, a more conservative operation so far as immediate mortality was concerned. In the development of the technic of cholecystectomy this assumption has proven erroneous, for it is actually less dangerous and certainly is followed by a better immediate convalescence.

In this series of 159 cases, there were 6 deaths: one from cholemia due to an extensive destruction of the pancreas, the second from cholemia in a case of an associated operation for a large incarcerated umbilical hernia in a very stout patient, and a third from cholangitis and pancreatitis, in which a stone was imbedded in the pancreas and was not found until autopsy. The fourth was from a gradual failure in an advanced case of pancreatitis induced by cholelithiasis, the fifth from peritonitis in an associated hysterectomy for chronic metritis, and the sixth from a subphrenic abscess due to leakage of the drainage tube. In four of these cases, death was due to the hopelessly destructive results incident to a long standing cholelithiasis, an irreducible minimum as designated by Richardson. The other two fatalities may be considered as of the preventable type. There were 118 cholecystostomies and 41 cholecystectomies in this first series. There were 4 post-operative fatalities among the 118 cholecystostomies, including the combined operations, and 2 among the 41 cholecystectomies. As the result of our follow-up letters and through personal consultations we were able to trace 85 per cent of these

patients. Among these 118 cholecystostomies, of which 95 were traced, there were 64 complete cures; 6 were markedly improved, 11 slightly benefited, and 12 were in no way helped. Of the unimproved cases, 7 were subsequently subjected to cholecystectomies, and 2 were reoperated upon for adhesions in the upper abdomen. There were 41 cases in which cholecystectomy was performed with the following results; not traced, 4; surgical deaths, 2; cured, 21; marked improvement, 2; improved, 6; and no improvement, 5. The postoperative complications in the cholecystectomized patients were less in evidence and the patients were far more comfortable than were those in whom biliary drainage was maintained for ten days. This was manifestly due to the fact that at most only a small cigarette rubber drain was employed and this was usually carried through a peritonealized channel in the groove of the liver to the site of the cystic excision. Furthermore, the interest of the patient is better fostered by a more frequent resort to cholecystectomy.

In the second series of cases there were 108 cholecystectomies and 51 cholecystostomies, a reversal of the previous ratio of two to one. There were 5 deaths among the entire number, all among the cholecystectomies. The first occurred in an aged woman with a chronically inflamed and greatly shrunken gall bladder, with adjacent adhesions causing an obstruction of the pylorus. On removing the gall bladder it was found to be malignant. A posterior gastroenterostomy was performed for the temporary relief of the pyloric obstruction. Death followed within a few days from an obstructive jaundice and cholemia. The second occurred in a frail woman, a bed-ridden invalid for more than a year. The gall bladder was the seat of a chronic cholecystitis of an interstitial type, and it was also much shrunken, but the operation was very easy and uncomplicated. One hemorrhoid was ligated and excised. Death occurred on the fifth day from pneumonia. The third death occurred in a patient upon whom a cholecystectomy had been performed for cholelithiasis and chronic appendicitis. A day before the expected discharge of the patient from the hospital after an uncomplicated convalescence, the lethal exitus came from a pulmonary embolus. The fourth fatality was caused by peritonitis after an operation for a simple dermoid cyst with coincidence cholelithiasis. At autopsy the common gall duct was found to be dilated and contained a considerable accumulation of fine sand, which, however, did not block the channel. The pathologist was unable to ascertain the source of the peritoneal invasion. The fifth patient succumbed on the eighth day after an uncomplicated hysterectomy for a myoma and a cholecystectomy. During the immediate convalescence there was no sign of danger. The temperature and pulse tracings ran a very satisfactory course until the eighth day when the patient was seized with severe pain in the splenic area and died within six hours. Upon autopsy the general peritoneal cavity was found free from evidences of peritonitis and death had occurred from the rupture of a subsplenic abscess. The surgical fields were quite normal. Sections of the spleen showed it to be the seat of an extensive chronic splenitis. As to the source of this infection, the pathologist could offer no explanation.

Comparing the two series, the wound infection was 8.2 per cent in the first series, dropping to 4.4 per cent in the second. Phlebitis was 2.5 per cent in the first, and 2.2 per cent in the second. The results in the second series excel those of the first. As to positive cures of the entire series, the results are about the same. When it comes to the relative difference between the qualified improvements and the unimproved, our statistics are distinctly in favor of the cholecystectomized patient. In other words, it would appear that the total removal of the gall bladder might be extended to still a larger percentage of cases.

One may summarize the outstanding points in favor of cholecystectomy as follows: The postoperative convalescence is decidedly better, the percentage of cures is larger, the mortality is less, and surgical complications are in the minority.



Against these advantages may be credited as a danger, the fact that should serious symptoms arise in the cholecystectomized patient which demand a subsequent operation the opportunity for surgical alleviation is endangered through the absence of the gall bladder. Such operations are more difficult and dangerous, for anatomic orientation is greatly obscured. However, the possibility of a subsequent operation is minimized by the superior results following the removal of the gall bladder when its mucous membrane or mural integrity has been seriously impaired. Such gall bladders under the best of drainage do not tend to spontaneous repair, but frequently the same distressing trend of symptoms recur when the biliary fistula closes. Less drainage and more ideal operations when the gall bladder is intact, and more cholecystectomies and fewer cholecystostomies when it is diseased would stand out as guiding principles if our observations have been correct.

The decision to subject a patient to an operation for a gall bladder lesion in the presence of some major or minor abdominal or gynecologic ailment must be arrived at only after a rigid weighing of clinical facts, such as the condition of the patient to withstand the additional risk and the actual danger to the patient without immediate intervention. In the presence of two lesions it may be wise to abandon the gynecologic procedure in favor of the biliary trouble when it is the dominant one. While from the mere scanning of our tables it would appear that these combined operations carry a higher mortality danger, the analysis of results does not sustain this criticism, for in three instances the second operation was too trivial to bear lethal weight in the outcome. In one there was a simple appendectomy, in a second a small hemorrhoid was ligated and quickly removed, while in a third a small dermoid was excised. The primary mortality danger should always stand as a signal barrier to a second operation if it seems to increase the hazards; on the other hand, to send a nervous or apprehensive woman from the surgical table with the prospect of a second ordeal facing her is like suspending the sword of Damocles over her head. However, in these crucial decisions a safe dictum is, "in case of doubt, defer the second operation to a more propitious time."

#### DISCUSSION

DR. REUBEN PETERSON, ANN ARBOR, MICHIGAN.—I have looked up my statistics, but did not have time to find out the end results of the cases.

I find that, so far as operations for gall-stones are concerned my practice is quite like Dr. Clark's. Since 1914, when I reported 1066 cases of gall-stones found during abdominal operations, there were 135 cases of gall-stones present and 57 of these cases were operated on; there were 55 cholecystotomies but only 2 cholecystectomies.

Since 1914 I find that I have been following the trend of surgical opinion and have removed the gall-bladder more frequently. Since 1914 there have been 934 cases where the abdomen has been opened and the gall-bladder palpated, and of this number there were 81 cases in which gall-stones were found; 36 out of the 81 cases were operated upon. There were 24 cholecystotomies and 12 cholecystectomies, showing that we have been removing the gall-bladder much more frequently than we did in the first series. It must be remembered that my operative material is almost entirely gynecologic and that gall-bladder disease or gall-stones is not the primary disease.

It may interest you to know that of 2000 cases, where the gall-bladder was palpated in the presence of pelvic disease 10.8 per cent showed gall-stones. It shows the gynecologist must be prepared to deal with gall-stones when he opens the abdomen for the purpose of dealing with other disease.

It seems to me, that Dr. Clark is entirely right when he says that the post-operative course of patients who have had cholecystectomies performed is much

better than where the gall-bladder has been drained. Of course, he speaks of the old days when we were afraid of peritonitis resulting from such drainage. We stitched the gall-bladder to the peritoneum and not infrequently symptoms would result, but those days have gone by, and when a tube is used now, the gall-bladder is dropped back into its original position. However, generally it may be stated that patients have a much better convalescence where the gall-bladder is removed, and their convalescence is but slightly if any prolonged.

I must say I am becoming more and more conservative about combined operations. There is a tendency on the part of our younger men to remove the gall-bladder after the pelvic disease has been cared for. That is a perfectly natural tendency because they want the experience, but personally I am becoming more and more conservative in this regard. I remember once taking out a kidney through a posterior incision in which the peritoneum was exposed, and bulging through the peritoneum was a large gall-bladder filled with stones. My assistant became very much excited and said, "Of course, you are going to remove these gall-stones?" I said to him, "Considering the condition of this patient, the gall-bladder looks very well where it is; we will let well enough alone." And that is my position at the present time. We want to do everything for the patient, but we are very conservative, and want to be sure that the additional operation on the gall-bladder will not endanger her life.

DR. JOSEPH BRETTAUER, NEW YORK.—While Dr. Clark's paper is extremely interesting, I do not intend to discuss it, but want to express my surprise at the possibility of reporting a series of 159 cases of gall-bladder disease, admitted during a comparatively short space of time to a gynecological department. No further discussion as to the competency of gynecologists to perform this operation is necessary, because a thorough surgical training is one of the prerequisites for gynecological operative work. The case mentioned in which a densely adherent dermoid cyst and the gall-bladder were removed at the same time is one about which opinion will differ regarding the propriety of such a procedure. I, for one, would consider the removal of an adherent dermoid cyst a sufficiently serious interference for one occasion.

DR. THOMAS J. WATKINS, CHICAGO.—The preoperative history of gall-stones in gynecologic cases is always important, if positive. A negative history of gall-bladder infection is not of much use as the negative cases after operation almost always recall a gall-bladder history.

The postoperative symptoms, in my experience, are not much more after drainage than after excision of the gall-bladder. If one inserts a small rubber tube, carefully inverts the gall-bladder, and drops it into the abdomen, using dry catgut as a purse-string suture, there is very little disturbance from drainage. The drain is allowed to come away between the first and second week; the suture holding it is cut and the tube allowed to escape as soon as it becomes loosened. With this treatment, the cases with gall-bladder drainage generally are not delayed in the hospital.

Dr. Parham, of New Orleans, in a recent editorial in *Surgery, Gynecology and Obstetrics*, admirably stated the reasons why the gall-bladder should not be excised except for cause. I entirely concur in what he said. The gall-bladder is often wrongly alluded to as a useless organ. The gall-bladder never atrophies except as a result of disease. If it were a useless organ, it would atrophy as a result of absence of function.

DR. S. M. D. CLARK, NEW ORLEANS, LOUISIANA.—I notice that there is a tendency among gynecologists to speak of the gall-bladder with a certain degree of apology, as though they were infringing upon a territory to which they had no right.

Inasmuch as Marion Sims and Lawson Tate were pioneers in this work, it seems to me, that by right of priority there is no need of apology. No one should do abdominal work unless he is in a position to competently dispatch any disease of the bile passages. Latterly cholecystectomy has greatly predominated cholecystotomy, and now the question of drainage after cholecystectomy is under active discussion. I would like to ask Dr. Clark what is his custom in the matter of drainage. In some cases wherein I did not drain there was a dark colored fluid that oozed from the wound on about the eighth or tenth day and I felt that had I left in a small rubber dam drain that this would not have occurred.

DR. RICHARD R. SMITH, GRAND RAPIDS, MICHIGAN.—I believe the time has come if it did not long since arrive, when we should divorce our gall-bladder surgery from pelvic surgery. I believe we should not regard a coexisting gall-bladder lesion as simply an incidence in a patient who presents herself with a pelvic lesion. The surgery of the gall-bladder and ducts is attended by quite as great difficulties and requires quite as great care and skill as pelvic work.

A gall-bladder operation demands the same sort of approach that we make when we go into the pelvis. It requires not only an ample incision, but also close and careful inspection of the gall-bladder, the changes in which may be slight. It requires palpation and examination of the common duct and the head of the pancreas, the stomach, duodenum and liver. If we gynecologists are to do this work, it should be done as thoroughly as we would do any sort of pelvic surgery. There are perhaps exceptions to the rule, but generally speaking, these two fields should not be operated at the same time. If a patient presents herself with a pelvic lesion, and we determine that she has also a lesion in the right upper abdomen, both should be given the consideration that our experience, and that of the general surgeon, show they demand. It is permissible under such circumstances to examine the other field at the time of operation, but rarely to operate it. I think we might as reasonably expect to do good pelvic work at the conclusion of a gall-bladder operation as to do a really good operation on the gall-bladder and ducts at the end of a pelvic operation.

Good surgery in either field demands too much time and makes too many demands upon the strength of our patient in the majority of instances to permit of both being invaded at the same time. I would, therefore, make a plea to regard them as separate important lesions, demanding two attacks instead of one.

DR. JAMES E. KING, BUFFALO, NEW YORK.—I would like to ask Dr. Clark whether in any of these cases of cholecystectomy he has had any return of the symptoms of a cholelithiasis; in other words, cases of mechanical stone formation. I have had three such cases come under my observation within a comparatively short time.

DR. HOWARD A. KELLY, BALTIMORE, MARYLAND.—I should like to speak on the subject from two or three standpoints. Back in the nineties I wrote an article on exploration of the whole abdomen every time it is opened for pelvic work. One of the immediate fruits of following such a course was that I speedily found many cases of gall-stones.

The next point is this: we ought to make a much more careful note of digestive symptoms in our pelvic disease histories, for I have often, in taking a retrospective history (after operation) found that the patients had had quite distinct gall-stone attacks not noted, even in the case of otherwise carefully taken histories. Given a case that has symptoms referable to the gall-bladder, where the seriousness of the operation below does not forbid it, I have been in the habit of opening the gall-bladder and getting out the stone by running my hand through the lower incision, and pushing the gall-stone up against the abdominal wall, making a small opening

there and everting the gall-bladder and taking out the stones extraperitoneally, then sewing up the gall-bladder, and dropping it back. This is very quickly done, is a simple, safe, and technically good operation.

As to cholecystectomy, perhaps I ought not to express an opinion because my experience is small, but there are cases where it is better to do something more than cholecystostomy, particularly in those cases where there is a hard, infected gall bladder, a nasty case for extirpation in a fat woman. These cases I have opened up with a liberal incision, surrounded the gall-bladder on all sides with gauze, cleaned out the interior with carbolic acid, then curetted out thoroughly and removed the mucosa, leaving the outer coats of the gall-bladder, and then dropped the gall-bladder back. These patients have done well.

DR. J. WESLEY BOVÉE, WASHINGTON, D. C.—I believe that doing this work haphazardly is dangerous. When we attempt to do work on the gall-bladder we cannot stop with exploration of the abdomen or the gall-bladder, but we must explore the cystic and common ducts, and perhaps the hepatic duct, because in a large percentage of cases we remove gall-bladders and leave an involved common duct.

DR. CLARK (closing).—When my paper is published it will be noted that in a large number of these coincident operations, the gynecologic procedure was a simple routine one, free from danger, and not prolonged. Under such conditions I feel that the gynecologist is lamentably derelict if he does not proceed with the other operation at once. One operation carries its inevitable influence great or small upon the nervous system of the patient and to be told after the first that a second awaits her, the succeeding interval is a most trying ordeal. Therefore, it is vitally important to weigh the situation most carefully and proceed at once if the outlook is good. I am sure that our statistics will testify to our conservative attitude. Also in many other cases not recorded here the second operation has been deferred until a more propitious opportunity.

Dr. Brettauer has criticized the two operations in the fatal case when a dermoid cyst was removed and a cholecystectomy immediately followed. In this case the gall-bladder symptoms were quite positive and the cystectomy was easy. I am certain that were any of you to be confronted by a similar complex, that you would realize the wisdom of this course unless the operator has a rooted objection to such coincident operations on principle. Each of us must travel the road best suited to his methods of dealing with the issues at stake. I have been impressed for some time with the fact that many gynecologists cleave so closely to a special line that when they are confronted with some abdominal condition that is not of a strictly gynecologic nature their judgment and surgical technic is not of the same high order, and the interest of the patient suffers. In response to Dr. Brettauer's question as to the number of these cases coming from a gynecologic ward, I may say that a very large percentage have been private patients. My scholastic function is to teach gynecology and these cases are not employed for demonstration purposes before our students. My friend and colleague, Dr. Edward Martin, put this question in a very clear way in answer to my invitation to be present when I operated upon a patient whom he had previously submitted to a gastroenterostomy for a gastric lesion, presumably of benign character. Subsequently a large movable tumor developed in the pelvis and she was referred to the gynecologic wards. I suggested that he be present, so that he might deal with any complication or operative sequel in the upper abdomen. He said, "Can any one draw a line across any part of an abdomen and say, above or below this line, I am proficient, but I dare not go beyond it? Should you find any condition in the upper abdomen requiring surgical intervention, go ahead with it."

As to Dr. Watkins' preference for cholecystostomy, it has been interesting to us, as we have analyzed our statistics to find that our preconceived ideas along similar lines of thought have not been confirmed. I am convinced that were Dr. Watkins to make a careful study of postoperative results in his own patients he would find more than he now anticipates who are still dyspeptics.

In answer to Dr. Clark of New Orleans, I would hazard the opinion that one of the chief disadvantages of the drained cases arises from postoperative adhesions, and that more ideal operations when the gall-bladder is conserved will eliminate a considerable number of bad results.

Dr. King asks as to the subsequent formation of gall-stones. This sequel is a rare one. More frequently the stone has been left behind at the first operation.

In the presence of an empyema of the gall-bladder, we follow the same plan as that announced by Dr. Kelly. In the presence of pus, it is hazardous to remove an adherent gall-bladder. In such cases, drainage and a "quick get away" is the best policy. Later the debris of the pyogenic storm may be removed if they give disabling symptoms.

DR. REUBEN PETERSON, of Ann Arbor, Mich., read a paper entitled  
**Review of One Hundred Cases of Women with Pelvic Tuberculosis  
 with Special Reference to the End Results of Operative Treatment.**  
 (For original article see p. 234.)

#### DISCUSSION.

DR. JOHN O. POLAK, BROOKLYN, NEW YORK.—The point that has impressed me clinically is the difficulty in making a diagnosis of pelvic tuberculosis at a time when the disease is operable, and second, the difficulty in excluding associated lesions, particularly lesions in the chest. Recently we have been able to do this by the x-ray. As shown in his paper, his mortality has not been due to the local focus but to the complicating conditions. The local conditions, therefore, are practically the only operable ones, and they are admittedly difficult to diagnose, and are less often diagnosticated.

The two classes of cases we have seen that have also given good results are those of the cystic and asitic variety, and those of the fibroblastic variety where the disease has become quiescent. We have had altogether 51 cases of tuberculosis in the pelvis of which 20 had lung involvement, as shown by a thorough investigation and x-ray of the chest. Five of these cases have gone over ten years, but amenorrhea has persisted in four. These cases have been followed very carefully and we have found that the amenorrhea persisted. At the time of operation the ovaries in these cases did not show any gross pathology. It was simply the association with tubal pathology and intestinal adhesions that we were dealing with. The tubes were removed, the disease became quiescent, and the patients are apparently cured because they have gained rapidly in weight, but in four of them such a periovaritis developed about these structures that ovulation was checked.

No class of cases presents such technical difficulties to the so-called radical operation, which is the procedure of choice. The adhesions are so extremely friable that intestinal injury is frequent and that again makes the procedure extremely difficult.

In discussing this paper it seems to me the points that should be emphasized are first, the difficulty in diagnosis; second, the necessity of excluding all associated lesions, and third, that in these cases where it is possible to remove the structures, total ablation should be the operation of choice. Where this cannot be done, know-

ing the majority of these cases are originally in the tubes, at least tubal ablation should be done, but in those cases where we find, without serious damage to the intestines, we cannot do one of these radical procedures, I believe the best results follow hygienic treatment.

DR. ARTHUR CURTIS, CHICAGO.—In some work on infections of the tubes, ovaries and uterus, part of which was reported before this Society last year, I found certain pathologic features of genital tuberculosis which deserve special emphasis. At the conclusion of my work a survey of the literature revealed that J. Whitridge Williams, in an excellent study reported in 1893, made observations which were similar in several respects.

Tuberculosis, independent of generalized tuberculous peritonitis, was present in 5 per cent of diseased tubes removed from over 300 of our patients. Attention to certain cardinal features should help us to recognize this disease, which now is seldom even suspected at operation.

The typical picture is analogous to that of a slowly developing, very severe, very chronic gonorrheal pelvic infection. The chief lesion is in the tubes, which show marked induration and enlargement. More minute study reveals that this disease primarily involves the tubal mucosa, in which it causes enormous hyperplasia and deformity. The ovaries, one or both, are usually involved and often abscessed. Pallor of the diseased tissues is frequent. In the absence of intestinal lesions, tubercles can seldom be noted at the time of operation.

The fimbriated end of the tube, a debated point, we found closed in about half the cases; often one is sealed, the other open. Caseous material may sometimes be squeezed from the healthy looking open fimbriated extremity. The uterus, if diseased, is usually secondarily involved, the mucosa being chiefly affected.

I would particularly emphasize the exceeding firmness of the adhesions. They often require tearing or cutting, much as malignant tissue, and cannot be separated by blunt dissection. Adhesions of this character, in the absence of adenomyoma or cancer, seem pathognomonic of streptococcal or tuberculous infection.

Tuberculous ovaries left behind at operation predispose to recurrence. With removal of tubes, ovaries and fundus, the outlook is excellent. In the last few years we have had two long standing fistulae in patients in whom the ovaries were left; there was also one permanently bad result, and one death among a total of 15 cases operated upon during this period.

DR. BENJAMIN P. WATSON, TORONTO, CANADA.—With reference to the necessity for removing the uterus in cases of tubal tuberculosis, I would say that in an investigation of a number of cases of tubal tuberculosis we found invariably that while the uterine end of the tube macroscopically was not involved, it was affected microscopically. In every case of tubal tuberculosis investigated, tubercles were found in the isthmus of the tube and extending into the interstitial portion of the tube in the uterine wall. If we remove the tube, leaving the uterus behind, we leave a tuberculous focus.

DR. HIRAM N. VINEBERG, NEW YORK CITY.—Practical experience sometimes is of more value than theory. In my own experience in private work I have encountered six cases that I can just now recall of tubal tuberculosis proven by the microscope. Some of these cases came under my observation over ten years ago, and in them there has been no complication or any recurrence. I think it is a rather radical position to take that if we find a tuberculous condition of one tube we should also remove the uterus and other adnexa. It is rather surprising to find such a large percentage of cases of tuberculosis of the uterus. Many years ago I had a case of tuberculosis of the cervix, and another of the uterus and endometrium, un-

mistakably proven both macroscopically and microscopically. A search of the literature at that time showed only 10 cases of genuine tuberculosis of the cervix, and very few cases of genuine tuberculosis of the uterus.

DR. JOSEPH BRETTEAUER, NEW YORK CITY.—There is one sign in early tubercular disease of the tube which has come to my notice repeatedly; the tube is not thickened and apparently is perfectly normal; only at its uterine end it appears kinked, with slight adhesions formed over the kinked part. After removing one such tube and finding the condition to be of a tubercular nature, I have been on the lookout for this sign and have been able to verify it in several instances.

DR. PETERSON (closing).—There is no question but what a series of cases of pelvic tuberculosis should be treated medically in order to see what can be accomplished. On the other hand, nonsurgical treatment of pelvic tuberculosis, like nonsurgical treatment of pulmonary tuberculosis requires special surroundings and apparatus, such as the majority of our clinic cases cannot obtain, consequently we have adopted a procedure which we think is perfectly correct, namely, that those women who come to our clinic should have surgical treatment.

Dr. Polak's contention is correct. I have such a respect for tuberculous adhesions that rather than break up a certain class of cases I would remove what I could with safety with the hope that the woman would eventually recover. The number of fistulae after these operations is appalling, and we should bear in mind this difference from a technical standpoint between tuberculous and ordinary gonorrheal adhesions.

From now on the clinician will be in a far better position to make a preoperative diagnosis of a tuberculous pelvic condition and will be prepared to deal with it more intelligently. In that lies our hope. I do not believe, considering the great proportion of cases where we find the uterus involved, where a systematic microscopic examination has been made, that it is a good routine procedure to leave the uterus, because it is contrary to all rules in dealing with tuberculosis in other parts of the body. Tuberculosis is a serious disease, and the possibility of pregnancy after these operations should not be considered, but the primary object is to rid the patient of a dangerous condition.

DR. ARTHUR H. CURTIS, CHICAGO.—I was under the impression that we very seldom find tuberculosis of the cervix, and I am anxious to know whether it is not just as well to perform supravaginal hysterectomy, without the removal of the tubes and the ovaries, rather than panhysterectomy.

DR. PETERSON (resuming).—In the majority of cases it is best to do the supravaginal operation because usually in this class of cases the uterus is plastered down by adhesions, consequently the supravaginal operation is much safer. In 100 cases we have only had two cases of tuberculosis of the cervix, consequently infection in that part of the body is remote, and the primary deaths will increase correspondingly if a panhysterectomy is performed routinely.

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DR. J. WHITRIDGE WILLIAMS, Baltimore, Maryland, presented **A Study of Frozen Sections through a Cadaver Showing the Anatomical Relations of a Large Uterine Myoma** of which the following is an abstract.

In May, 1921, Professor Weed of Baltimore informed me that he had received from the Anatomy Board a female cadaver, which he thought might contain a pregnancy. His records showed that the body had come from the morgue, and that the death cer-

tificate of the coroner stated that the woman was 26 years old and had died from natural causes. I found the partially frozen body of an apparently middle aged colored woman, which presented no abnormalities except an abdominal tumor which reached to within three fingers of the xyphoid cartilage, but I could not determine whether it was a pregnant uterus or a tumor of some other kind. It was decided to freeze the cadaver thoroughly and then to section it in various planes in the hope that we might secure information concerning the relations of the pregnant uterus to the rest of the body and particularly to the pelvic floor.

After the body had been thoroughly frozen, the head and the legs were removed, and the trunk was bisected by a sagittal mesial section, which was so accurately made that it involved the pubic joint and the urethral canal. It was then found that instead of a pregnant uterus we had to deal with a lobular myoma, whose largest lobe distended the abdominal cavity, while a smaller lobe completely filled the pelvic cavity, with its lower pole protruding 2 cm. below the line joining the lower margin of the symphysis and the tip of the last sacral vertebra. In other words, the smaller lobe filled out the pelvic cavity and distended the pelvic floor just as a child's head in the second stage of labor before it reaches the vulva.

Two other sagittal sections were made through the right half of the body, one 3 cm. to the right of the mesial section, and the other 3 cm. to the right of the second. The left half of the body was divided by four oblique sections which roughly corresponded to the oblique planes which Hodge employed so advantageously in studying the anatomy of the pelvis. The first of these extended through the promontory of the sacrum and the top of the symphysis, while the others were parallel to it and at varying distances below the plane of the superior strait.

Mr. Max Broedel made tracings of the sagittal sections, from which he prepared pen and ink drawings. The oblique sections were allowed to thaw in a solution of carbolic acid and formalin and were then photographed. After careful dissection the various landmarks were identified and have been indicated in the retouched photographs.

The object of this communication is to demonstrate the topographical relations of a large myoma and to study the changes which it has produced in the pelvic structures, as well as to show the differences between the distention of the pelvic cavity by a myoma and that resulting from the head of a child at the time of labor.

(Dr. Williams then briefly described the conditions existing in the sagittal sections; considered the degree of distention of the abdominal and pelvic cavities resulting from the abdominal contents; then described the tumor itself, and the changes produced by it in the ovaries and the uterine ligaments. He then considered the oblique sections through the left half of the body which illustrate the anatomical distortions produced by the presence of the tumor in the pelvic cavity, and finally studied the changes in the vascular supply of the pelvic cavity and its contents.)

The specimen gives an extraordinarily accurate idea of the extent of the abdominal and pelvic distention which may be produced by the presence of a large myoma. Owing to the fact that the nodule, which almost completely filled the pelvic cavity, arose from the posterior surface of the uterus, the distention has occurred altogether posterior to that organ, with the result that it together with the bladder has been compressed against the anterior pelvic wall. In other words, the distention has occurred entirely within the pouch of Douglas. This has resulted in a remarkable displacement of the broad ligaments, so that they are in contact with the anterior and lateral wall of the pelvic cavity; instead of dividing



it into an anterior and posterior segment, the former has become obliterated and the latter immensely distended. Owing to the forward displacement of the uterus and of the median ends of the broad ligaments great elongation of the uterine arteries was necessary. This apparently has occurred to an even greater extent than was essential, as is shown by the fact that instead of entering the base of the broad ligament shortly after they have been crossed by the ureters, the arteries extend forward almost to the symphysis pubis before so doing, and at the same time have become unusually convoluted. Moreover, even though myomata are in general very poorly vascularized, the demands for the nutrition of the tumor have necessitated an increase in the blood supply as is shown by the unusual hypertrophy of the pelvic veins, which has attained a degree only encountered in full term pregnancy.

Upon comparing the changes in the pelvic floor in this instance with those occurring during normal pregnancy, several very important points of difference should be noted. In the first place, when the pelvic cavity is occupied by the fetal head late in the second stage of labor, the distention proceeds from a central point, with the result that the cervical canal together with the base of the broad ligament becomes expanded outwardly in all directions to an equal extent, so that while the anterior and posterior peritoneal pouches are temporarily obliterated, no such change occurs as was noted in this instance. In it the pelvic tumor lay behind the uterus, and consequently as it increased in size the posterior pouch became immensely distended, while the anterior pouch was obliterated by the cervix being pressed firmly against the symphysis pubis. At the same time the broad ligaments were flattened out against the anterior and lateral portion of the pelvic wall instead of involving its posterior segment as well. The distention has likewise led to comparable changes in the relations of the pelvic fascia and the structures beneath it, which instead of being pushed centrifugally outwards from a common center, has become distended only posterior to the uterus, with the result that the levator ani muscle forms a continuous but thin pelvic diaphragm, instead of being perforated and pushed downward and outward to form the lowermost portion of the birth canal.

Finally, particular attention is directed to the unusual picture of the anatomical relations which have been obtained by the employment of oblique sections through the pelvis parallel to the superior strait, and which indicate the advantages which might well follow the use of similar sections in the study of the dislocation of the pelvic floor during labor, as well as, in the study of the part played by the basis of the broad ligaments in the maintenance of the normal position of the uterus in the nonpregnant woman.

#### DISCUSSION

DR. WILLIAM E. STUDDIFORD, NEW YORK CITY.—In the first place, the mechanism of the pressure on the pelvic floor is directly opposite from what we get in labor. The pressure is all coming from inside the peritoneum and pressing the fascia of the pelvic floor forward into the vagina and under the symphysis, whereas in labor we have dilatation of the cervix and spreading of the fascia shows how the bladder is pulled upward by its attachments to the uterus. The tumor pulls up the anterior segment with the bladder, not the posterior segment, and instead of distention of the fascia which you get with dilatation in labor there is direct pressure behind the fascia, instead of pushing the fascia off toward the posterior wall of the pelvis.

One other thing is the relation of the sacral plexus to the sacroiliac joint, which will easily account for the terrific pain that many women get when we have ex-

tensive lacerations of the pelvic floor which extend almost to the spine of the ischium. It shows how easily some of the branches of the sacral plexus could be involved in the laceration. The cicatrix that forms afterward would cause extreme pain.

I am sorry Dr. Williams cut the sections the way he did from a physiological point of view showing the relations of the levator ani muscle, instead of using the symphysis as a radius and following the course of the genital canal. He cut parallel sections so that we do not get quite as good a demonstration of the levator ani muscle as we would if the sections had been cut in wedges, so to speak, more nearly parallel to the fibers, which would give better demonstration of the attachments of the pelvic fascia.

*(To be continued in October issue.)*

## NEW YORK OBSTETRICAL SOCIETY\*

ANNUAL MEETING, MAY 9, 1922

THE PRESIDENT, DR. R. H. POMEROY, IN THE CHAIR

### DR. W. E. CALDWELL presented a report on the Intravenous Use of Paraldehyde in Eclampsia.

Two years ago an eclamptic patient with the marked delirium, so common in such cases, was admitted to the Sloane Hospital for Women. One-third of a grain of morphine was given hypodermically. The patient's delirium increased. The administration of paraldehyde by vein was suggested with considerable apprehension and 1 c.c. of U. S. P. paraldehyde was injected into the median basilic vein. The effect was surprising. Before the injection was finished the patient was asleep. The respirations became deep and regular; the cyanosis cleared up; the pulse was full, regular and much slower. The patient slept soundly for an hour and a half, although she could easily be aroused and she afterwards remained quiet and relaxed for several hours. She ultimately recovered.

In obstetrical practice, there are many conditions in which a drug that would enable the immediate control of convulsions and delirium would be of great value. For instance, in status epilepticus during pregnancy; in serious cases of chorea; in maniacal stages of puerperal insanity; and especially in eclampsia. Morphine frequently gives a primary excitement stage, and also causes vomiting, thus increasing the danger of asphyxia. Hyoscin is a dangerous cardiorespiratory depressant. The use of chloroform and ether to control convulsions has proved very unsatisfactory. Tweedy, in 1911, called attention to the uncertain action of medication by the stomach, and the danger incident to frequent regurgitation of either food or medicine from the stomach into the throat. Rectal medication is slow and uncertain. If, therefore, paraldehyde could be given into a vein without danger, it seemed to us that we had a valuable addition to our armamentarium in the treatment of the various conditions mentioned above.

The credit for being the first to use paraldehyde intravenously was claimed by Noel and Souttar, in 1912. They used 15 c.c. of paraldehyde and 15 c.c. of ether in 150 c.c. of 1 per cent cold saline solution. Within 40 seconds of starting such an infusion the patients were asleep; and within 90 seconds, the corneal reflexes were gone, allowing them to do short operations. The effect of the drug began to disappear as soon as the infusion was finished. The patients had a short, deep sleep, from which they could easily be aroused, and the relaxation continued for several hours. There seemed to be no after-effects from the drug in these cases.

\*Dr. Kross' article read before the April 11th meeting has been unavoidably delayed, but will be published in the October issue.

Atkey, in the following year, 1913, treated a case of tetanus by the intravenous injection of paraldehyde and ether as described by Noel and Souttar. He gave 150 c.c. of 1 per cent saline solution with 5 c.c. of paraldehyde and 5 c.c. of ether for his first infusion. Not getting the result he desired, he increased the dosage next day to 15 c.c. of paraldehyde and 15 c.c. of ether in 150 c.c. of saline, and continued to use paraldehyde and ether in this manner each day until on the eighth day when he gave 300 c.c. of saline solution with 30 c.c. of paraldehyde and 30 c.c. of ether. The tetanus convulsions were controlled and the muscles relaxed for several hours after each infusion. The patient was thus saved from exhaustion, while the body, aided by other remedies, was given time to eliminate the toxin. The patient recovered.

Honan and Hassler, in 1913, reported their use of paraldehyde in  $2\frac{1}{2}$  or 3 per cent solution both alone and with ether. They noted no bad results. In 1914, Collier, from the Craig Colony for Epileptics, reported the use of paraldehyde and ether in seven cases; four cases of minor operations, one case of tetanic status and two cases of epileptic seizures. He used from seven to 22 c.c. of paraldehyde and ether, diluted in 150 c.c. of 1 per cent saline solution and observed no bad results.

In the same year, Cale reported six cases, in which he used paraldehyde in dosages of 5 to 15 c.c. with an equal amount of ether, in saline solution, and without bad results. All these authors call attention to the danger of using warm saline, unless it is well and constantly shaken, as the paraldehyde and ether gather at the top of the solution.

Dr. Charles C. Lieb, Professor of Pharmacology in Columbia University, did not think that these very small doses of paraldehyde would be dangerous, but he suggested that the paraldehyde be diluted with 15 or 25 c.c. of normal saline, in order to prevent the irritating effect of paraldehyde, especially when it gets into the subcutaneous tissues. His experience with animals, where paraldehyde was used as an anesthetic, made him believe that it was comparatively safe when carefully given. Dr. George Wallace, Professor of Pharmacology in New York University, also thought it was safe to use it in small doses, if carefully given. In cases where respiratory failure occurs, artificial respiration and atropine would be necessary. It would not be necessary to continue the artificial respiration very long since the action of the drug is so transient.

At the Sloane Hospital for Women we have now used paraldehyde in 15 cases. All the patients have ultimately recovered, and, in none have we seen any bad effects from the medication. Our average dose has been 1 c.c. injected directly into the median basilic vein. The largest dose which we have given at one time has been 2 c.c. This was given in a case of chorea, where morphine and hyoscin had failed to control the convulsions. In this case, the patient immediately went to sleep and slept soundly for one and a half hours, and remained quiet for several hours afterwards.

In the treatment of eclampsia, we realize that each case must be individualized. Besides the giving of morphine, our general principles in treatment are those which Tweedy followed at the Rotunda Hospital with such remarkable results, and which were advocated later by Stroganoff. We also use venesection in some cases. We do not empty the uterus except as conditions develop that make it necessary, or unless the patient does not improve under the treatment instituted.

In the majority of our cases our initial dose of 1 c.c. of paraldehyde has proved sufficient to control either convulsions or delirium in less than one minute. The patients have gone to sleep quietly. A hypodermic of morphine, varying from

1/3 to 1/2 grain, is also given, and is repeated in smaller doses until the respirations are definitely reduced. It is possible, while the patient is under the hypnotic action of paraldehyde, to examine her thoroughly, to wash out the stomach, to give a colon irrigation, and to do a venesection if necessary without greatly disturbing her. The hypnotic effect of paraldehyde in such small doses lasts from an hour to an hour and a half.

In one case, that of a patient who had had five convulsions, two doses of paraldehyde were given within two and a half hours and, though the patient was immediately quieted, another convulsion occurred within an hour, and a third dose was given, making altogether 3 c.c. within four and a half hours. The patient afterwards had two more convulsions: one five hours, and one eight hours, after the last dose of paraldehyde. During this time, she was delivered. In this instance the paraldehyde was given at shorter intervals than in any other of our cases. Notwithstanding bronchopneumonia and pulmonary edema, the patient recovered. In another case, 5 c.c. of paraldehyde were given within twenty-four hours. But the majority of our cases have required only one or two doses of paraldehyde, besides the large dose of morphine which we give routinely.

From our small series of cases, and from those that have thus far been reported in the literature, our conclusions are as follows:

1. Paraldehyde, either undiluted or diluted with saline solution, can be given into a vein in small doses very slowly, with apparent safety.
2. Its action is to produce a deep sleep in less than one minute, relaxing the muscles, thus preventing exhaustion due to muscular contractions, while other means are being used to eliminate the toxins, or while waiting for the physiologic effect of morphine.
3. Its hypnotic effect is of short duration, from one hour to one and a half.
4. It is much more satisfactory than chloroform or ether for the immediate control of convulsions and delirium.
5. Since the hypnotic effect is followed by muscular relaxation lasting for several hours, less morphine is required than would otherwise be necessary.
6. The results thus far obtained, both by ourselves and others, fully warrant the further trial of paraldehyde; although a drug so powerful in its action should be used only with the utmost care.

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#### DISCUSSION

DR. F. A. DORMAN.—I would like to ask Dr. Caldwell if he has noticed any effect on the uterine contractions if the patient was in labor when the drug was given.

DR. W. E. CALDWELL.—The majority of our eclampsias have gone right ahead in labor and have been delivered. We have seen no prolongation of the first stage

on account of the paraldehyde, but have on account of the morphine, comparing the controlled cases.

We have given the paraldehyde undiluted. I believe it safer to give it diluted. It can be given more slowly by having it diluted, and there is not so much danger of getting into the subcutaneous tissues.

DR. WM. P. HEALY reported a case of **Intractable Vulvar Ulcer (Esthioneme) Cured by Proteus Vaccine.** (For original article see page 286.)

DR. HERMAN GRAD presented a **Device for Holding Sutures in Vaginal Plastic Operations.** (For description see page 291.)

DR. HERBERT THOMS, of New Haven, Conn., read by invitation, a paper entitled **Outlining the Superior Strait of the Pelvis by Means of the X-Rays.** (For original article see page 257.)

#### DISCUSSION

DR. ALFRED B. SPALDING, SAN FRANCISCO, CALIF.—Dr. Thoms presented very interestingly Fabre's method, which is based on the mechanical idea of measuring the pelvis, while the method that I am about to present at a coming meeting of the Chicago Gynecological Society embraces an entirely different conception of measuring the pelvis and is based on a mathematical principle.

Our roentgenologist at Stanford, Dr. Chamberlain, decided that a method could be devised whereby he could measure the pelvis on the same principle that he was able to measure objects in the eye, and in reviewing the literature, it was found that Runge and Greuenhagen in 1915 had devised a very elaborate method for measuring the shadows by using a "plumb bob." It is a little piece of lead with a cross of copper wire, hung on a string. That is fastened under the target, which is set at a known distance above the plate,—arbitrarily 80 cm. I might say here that Manges, about 1912, brought out a second point, namely that of locating pelvic diameters by the use of the stereoscope. In placing the "plumb bob" over the x-ray plate at a distance of 80 cm. and then shifting it for a second picture exactly 10 cm., two known measurements are obtained,—one 80 cm. in a perpendicular line and the other 10 cm. on the horizontal. From these two measurements it is possible to figure out a formula for getting any measurement desired, provided, of course, you know what you want to measure.

At this point in his remarks, Dr. Spalding referred to a second observation which was made by Dr. Chamberlain, namely, that the latter could obtain an exact measurement with the "plumb bob" of a ten cm. iron rod placed over the symphysis, that he could measure this rod even if one end were higher from the plate than the other, and could measure in the same way any other two points on the pelvis so long as he placed the points right, but if a patient moved, the rod would not measure exactly 10 cms. and this fact is used in correcting for error due to the patient's moving.

DR. I. SETH HIRSCH (by invitation).—The determination by the x-ray of the pelvic measurements, particularly the size of the inlet, has been an insistent problem

almost since Roentgen's discovery, for, as far back as 1897, Pinard and Varnier tried to make radiographic pelvic measurements by comparing the exposure of the pelvis in the living, with a normal specimen, taken under nearly identical conditions.

The methods utilized may be considered under five headings: 1. comparative methods; 2. teleroentgenographic methods, with or without posturing; 3. frame methods; 4. triangulation methods; 5. stereoscopic methods.

Comparative and teleroentgenographic methods are a modification of those of Pinard and Varnier, who, because of the technical difficulty of those days, could not make the radiographic examination with more than 70 centimeters target plate distance, at which distance it was necessary to subtract several centimeters from the plate measurement, in order to get a near approximation to the actual measurement. But with the apparatus now at our disposal it is possible to make radiographs at 10 feet with comparative ease. This method is simple and direct, with certain limitations.

However, both these methods are inaccurate, without special posturing of the body, because of the varying relationship of the pelvic inlet to the horizontal and the resulting foreshortening of the diameters. This difficulty was appreciated early in the history of this procedure for in 1896, in an attempt to avoid this, Albert, of Dresden, radiographed the pelvis by placing the woman in the semirecumbent position, with the spinous process of the last lumbar vertebra and the upper border of the symphysis at the same level, thus making the plane of the pelvic inlet parallel to the surface of the plate. The tube was centered perpendicularly over the pelvic inlet, parallel to the surface of the plate. The measurements obtained from the resulting radiographs were checked against the target-plate distance and the distance of the upper border of the symphysis from the plate, for the distortion of the diameters in such a radiograph depends on these factors.

With the limited means at his disposal, and because of the added technical difficulties resulting from the posture, the essential points on the radiograph were too indistinct for this method to be of any value. Wormser, in 1900, tried to overcome the technical radiographic difficulties arising from this position by placing the patient in the dorsal position and elevating the legs and pelvis and placing the plate obliquely under the buttocks. The plane of the plate was made parallel to the pelvic inlet by means of a pelvimeter, one arm being at the symphysis, and the other opposite the spinous process of the last lumbar vertebra. The tube is centered perpendicularly over the plate.

Pfahler also described a method based on Albert's. Albert's method has been further modified by Ridell in 1907, who placed the patient in the Trendelenburg position, fastening the plate to the buttocks and placing the tube under the table, centering perpendicularly to the pelvic plane.

The difficulty in all these methods arises from the impossibility of accurately placing the pelvic inlet parallel to the plate, from the necessity of using large focal distances, in order to minimize distortion and from the impossibility of accurately determining the exact site of the sacral promontory in such a sagittal view.

Fouchacourt, for accuracy, recommended measuring only the transverse and oblique diameters and estimating the anteroposterior from the shape of the pelvis.

Fabre and Fouchet suggested placing the finger, capped with a metal thimble, over the sacral promontory. This is rather an objectionable procedure.

Manges in his method, which comes under the head of triangulation estimations, takes the uppermost border of the upper sacral foramen as the point to be measured from.

The sagittal examination may be controlled by a lateral exposure, to check up the size and position of the sacral promontory.

Fabre and Fouchet, in 1899, were the first to suggest the "frame" method. By

means of a metal frame, placed on the pelvic abdomen, in a position corresponding to the pelvic obliquity, the borders of the frame having teeth one centimeter apart, the pelvic measurements were estimated by the number of teeth recorded on the plate. The frame is placed with its anterior border on the symphysis and its posterior border in the space between the last lumbar vertebra and the posterosuperior spinous process. This method has been modified by Marie and Chizet, using a wooden frame, with metal points one centimeter apart and radiographed in the same position as in Fabre's method. Connecting the centimeter marks on the plate, the picture of the pelvis is marked by a series of squares. The pelvic measurements may be estimated by transferring to paper, ruled in exact square centimeters, the location of the bony points in the corresponding squares on the radiograph. An elliptical frame has been used instead of the square one, and the measurement made by complex mathematical formulae. In the latest modification of this method by Haret, the patient is placed in the ventral decubitus in a frame similar to that of Fabre's, the target of the tube being placed 65 cm. above the plate and 20 cm. away from a perpendicular through the pubis in the direction of the feet of the patient. In this way the ray strikes the plane of the inlet at right angles.

The fourth general method is the triangularization method, first used by Levy and Thumin, who attempted to figure out by mathematical formulae the true measurements of the pelvic inlet on the basis of certain measurements, namely, the distance of the upper border of the symphysis from the plate, the target plate distance and the angle of pelvic obliquity, which was estimated from the angle of inclination of the external conjugate.

The modern methods are based upon the MacKenzie-Davidson method of localization of objects by a known tube displacement, at a known plate distance, and the making of two exposures on one plate.

The two shadows of the point in the body are connected and the location of the point above the plate surface may be estimated by a mathematical formula or by constructing a phantom with strings, utilizing the target plate distance, the target displacement and the shadow displacement distance as known factors.

Manges localized the position of the upper edge of the first sacral foramen and the upper surface of the symphysis and measures the distance between them. The true conjugate is obtained by subtracting one-half inch from this measurement. The objection to these or other methods of double exposure on a single plate is the blurring of the images and the difficulty of making out the bony landmarks.

The numerous methods of localizing foreign bodies developed by the war may be applied to the measuring of the pelvis. They are all more or less complicated, difficult and tedious, though many of them give very exact figures, like the method of Chamberlaine presented here tonight by Dr. Spalding.

The fifth method is a stereoscopic method, in which stereoscopic exposures are made and viewed in the regular way. By the use of an illuminated ruler or movable metallic points, placed directly in the phantom image, the pelvis may be accurately measured.

The advantage of this method is obvious, as the whole pelvis is clearly shown and all possible pelvic deformities determined. It also gives an idea of the relationship between the fetal head and the pelvis. Stereoscopic measuring methods, with the necessary apparatus, have been described by Drüner, Pulfrich, Trendelenburg and others. I have seen such apparatus abroad, but I know of none in this country. Triangulation measurements may also be made from the stereoscopic plates.

It is thus apparent that most of the methods reported in the last few years have been but modifications of the original principles laid down by Varnier, Albert, Fabre and MacKenzie-Davidson.

A method to be of real value and of general application should be simple, not

require extra apparatus, easily and quickly applicable and exact. By far the simplest, if it should prove accurate, I think, is the method that I have been studying for Dr. Bailey. It is a method similar to that used in the examination of the heart, which I have mentioned, the tele- or distance radiographic method. The examination is made at a plate distance of 250 cm., which does away with divergence distortion and with the pelvis in the Albert position, which does away with angular distortion of the inlet plane.

Clear radiographs may be obtained even in the older pregnancies with our modern apparatus. The radiographs may then be traced and the measurements made. By checking this simple method with the most accurate of the complex methods we hope to ascertain its practical value.

DR. THOMS (closing).—With regard to Dr. Hirsch's remarks, I would say we used the target at a greater distance from the plate during the first part of our experiments. We found there was less distortion because of this increased distance. However as long as we can correct distortion by reduction to the proper size, we can secure better pictures and shorter exposure with the target nearer the plate. We use  $3\frac{1}{2}$  to 4 feet.

I do not think that Dr. Spalding quite understands the method as I have outlined it. It has nothing to do with Fabre's method. With the Fabre method you disregard distortion and simply count the notches in the frame to give you the measurements.

With the method that I have described you get a picture or outline of the inlet of the pelvis in its true proportions without distortion. You may place a ruler on the plate or film and measure it in its various diameters much as if you had the dried pelvis in your hands. The distortion is all corrected. It does not take into consideration the outlet of the pelvis at all. It is simply photographing the inlet and correcting the equally distorted image by means of reduction with the camera. This may be done on paper or a film.

DR. HERMAN GRAD presented a study on the **Pathology of Uterine Bleeding Based on an Analysis of One Hundred Cases.** (For original article see October issue.)

## THE OBSTETRICAL SOCIETY OF PHILADELPHIA

*STATED MEETING, APRIL 6, 1922*

THE PRESIDENT, DR. STEPHEN E. TRACY, IN THE CHAIR

DR. WILLIAM EDGAR DARNALL presented a paper entitled **Malignant Papilloma of the Kidney.** (For original article see page 273.)

### DISCUSSION

DR. GEORGE W. OUTERBRIDGE.—Dr. Kolmer states that this papilloma presented definite malignant characteristics. That is to say, it is a multiple branched growth, having a delicate fibrous stroma, covered with the typical multilayered epithelium such as we find in the bladder, ureter and kidney pelvis, but at the base of the little papillary growths there are distinct changes in the character of the cells, with invasion of the underlying renal tissue. We know all of these papillomata



start usually as benign growths and that those occurring in the bladder, if destroyed by fulguration, do not recur as a rule. The point at which malignancy begins is sometimes exceedingly difficult to distinguish even under the microscope, and some of the very best men will refuse to make a diagnosis from a specimen removed by the cystoscope unless they have some of the wall of the ureter or bladder, whichever it may be, in addition to the papillomatous growth. Professor Pick, of Berlin, claimed that from a bit of one of these papillomas alone he could not make a diagnosis of malignancy; that he must have some of the basal tissue showing definite invasion. In this case of Dr. Darnall's, and from what Dr. Kolmer said, I would say that probably for a number of years this tumor was histologically benign. That is when he first saw her if the kidney had been removed and sectioned it would probably have not showed any definite invasion of the renal tissue by the papillomatous growth, but that with the passage of time the cells took on malignancy. I think some of the frank carcinomas of the renal pelvis originate as did this tumor. The fact that the old lady lived four years from the time Dr. Darnall first saw her would indicate that the process was comparatively benign. When a diagnosis is made, because of the well-known tendency of these tumors to become malignant later, extirpation should always be advocated.

DR. HARRY A. DUNCAN.—I have seen two cases of this kind and had no idea that they were so rare. The last case I remember distinctly because the family doctor tried to trip me on the diagnosis and did. I saw an old lady in an acute attack of what I thought was intestinal obstruction. She had a mass in the lower part of the right abdomen, was vomiting, had no bowel movements for several days, enemias did not relieve her. She gave a history of having passed a great deal of blood by the bowel and I remember telling the doctor I rather thought it was carcinoma of the cecum. He laughed and said he had watched her for four years and that this mass had been present and she had frequent attacks of hematuria. We cystoscoped her and she had microscopic traces of blood from the ureter. We found a papilloma filling the pelvis of the kidney and there were papillomatous growths down in the ureter. She lived about three weeks and died apparently because the other kidney was not able to carry on the work of the two. She was about seventy-two.

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DR. GEORGE W. OUTERBRIDGE read a paper entitled **Accidental Perforation of the Uterus; Report of Three Cases.** (For original article see page 276.)

#### DISCUSSION

DR. EDWARD A. SCHUMANN.—I recall a personal case in which the perforation of the uterus was done in a way that I had not previously known. In terminating a three months' pregnancy in a young woman with decompensated heart disease, I used a Goodell dilator under gas anesthesia to dilate the cervix, and after securing, as I thought, proper dilatation, I introduced a very large pair of forceps and on my first pull down found, to my horror, omentum. Laparotomy was immediately done and I found the curved blade of the Goodell dilator had gone into a rather sharply retroverted uterus, and passed through the lower uterine segment, into the peritoneal cavity. There was no hemorrhage whatever through the rent, which was of considerable size. Happily there was no untoward result. I should like to venture an even more radical method of treatment that Dr. Outerbridge had advised. I believe, in cases of perforation of the uterus, immediate laparotomy should be performed in practically all cases, with but one exception, that is uteri

which have been perforated under strictly aseptic circumstances by skilled operators in the course of a curettage for diagnostic purposes.

DR. JOHN A. MCGLINN.—Perforation occurred in rather a unique way in my experience. It so happened that I did not have a dilator, but used a bougie, which caused a perforation. I sutured the tear and the patient got well. I have had several cases where I took out catheters from the posterior culdesac, where patients attempted to produce abortion.

DR. WILLIAM EDGAR DARNALL.—I do not suppose anybody who does many curettements avoids perforations of the uterus. I have done so in four or five cases. In all cases that have infection I agree with Dr. Schumann that the abdomen should be opened; all cases that come in to the hospital having been done by somebody else and you know the uterus is perforated but do not know how they have been handled and in all those cases in which there is omentum, or intestine, protruding through, the uterus of course should be opened. But in doing a good clean case under aseptic conditions, if the curette slips away and goes through the uterine walls and you recognize it at once and you know you have done no damage inside, I rarely open the abdomen. In one case we could not get a very clear history of how the condition had started, but the patient was having a considerable hemorrhage. We attempted to do a curettement. The first grasp of the placental forceps brought down a string of what looked like small intestine. We immediately opened the abdomen and found a rent in the back of the uterus one and a half or two inches across. We did a supravaginal hysterectomy and then looked around for the damage to the gut. We found it was not small intestine, but the lower sigmoid. The mucosa and submucosa had been stripped out of its bed. There was no endothelial covering but the outer layer of the gut attached to its mesentery formed a trough from which the mucous layers had been stripped. It must have been stripped out for at least seven inches. We resected, put in a Murphy button, buried it in the trough and formed an outer layer covering around it. We did this with great trepidation because we did not see how it could possibly get a competent blood supply, but it did and the patient recovered.

DR. EDWARD E. MONTGOMERY.—I have had the misfortune to see a number of women in whom perforation of the uterus had occurred, the majority of them from attempts at abortion by either the patient or others. Various instruments, as meat skewers, crochet needles and catheters had been used. I heartily agree with the writer, in the wisdom of immediate operation where it is evident that the patient is suffering from infection and particularly when dilatation has been followed by forceps. I have seen several cases where loops of intestine or the omentum have been dragged into the uterus and one in which the anterior wall of the rectum had been pulled off by the repeated attempts to grasp what the operator took to be the placenta.

I cannot accept the dictum that such operation should follow perforation of the uterus in dilatation of the uterine canal in nonpuerperal cases with the bougie, even though it be evident that perforation has occurred.

I believe that the majority of these cases will recover, and in operation have seen many uteri showing the cicatrices of such injuries.

There is more danger in the use of the parallel dilator than from the bougie, as the former tears an opening. An injury of the latter variety was seen by me where the entire anterior wall was torn open, severe hemorrhage resulting and the patient died subsequent to the operation for its relief. Perforation occurs very easily in the puerperal case, and also readily in the nonpuerperal, where the uterus is acutely flexed and efforts are made to force an instrument

through the canal. These cases should be watched, but only subjected to operation when indications of hemorrhage or infection become apparent.

DR. COLLIN FOULKROD.—I believe that many of the cases brought to the hospital with perforation done by physicians, were done because the patients were curetted on a bed. In these instances the patient settles down in the soft bed and the inexperienced operator does not recognize that fact. I have always felt that the finger is a very safe thing to use and yet I recall an obstetrician of some years' experience, who brought in a patient in whom the whole posterior wall from fundus to cervix was torn away immediately after delivery, in attempting to remove the placenta with his finger. In that case vaginal hysterectomy was done and the patient recovered. In another instance in which the operator pulled out intestine and injured it the patient died. I think the two conditions in which death will occur include injury of intestine and of infection. Most of us have seen perforation with small curette, those of us who do curettage before we do laparotomy have observed the site of a perforation, put a stitch through and found the patients made a very good recovery.

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**DR. FREDERICK E. KELLER read a paper entitled Volvulus of the Sigmoid Following Elective Cesarean Section.**

Fortunately, acute intestinal obstruction, with its varying causes, complicating pregnancy, labor, or the puerperal period, is rare. There are only about one hundred cases recorded in the literature. Of those cases in which the obstruction occurs subsequent to delivery, a very high mortality obtains.

CASE REPORT.—Mrs. L. M., age thirty, primipara, husband died of pneumonia three weeks before patient went into labor, at which time she developed a state of acute mania from which she drifted into a profound melancholia. In this condition labor began. Justo-minor pelvis. Fetal heart sounds plainly audible in upper left quadrant.

After two days of pains, the breech had not engaged, nor had cervical dilatation progressed further than one finger, its condition being unchanged since patient's admission. She stated frequently she wanted to die in order to be with her husband. The family was extremely desirous for a live child owing to the late catastrophe. An elective cesarean section was performed, (Sänger operation) and a live female infant obtained.

An apparently normal amount of postanesthetic vomiting followed, patient's reaction good, abdominal distention not marked. About thirty hours postoperative, the patient complained of a sharp pain about the umbilicus, and felt nauseated. An enema was given, but it returned clear immediately. A rectal tube was inserted and an ampoule of pituitrin given, no gas passed and the pain was increased. Gastric lavage gave no fecal material, nor did it control the vomiting. By this time the patient was vomiting with each exacerbation of the pain and the abdomen was markedly distended. The rectal walls were found collapsed against the examining finger.

Forty-eight hours after her first section a second laparotomy was performed. The small and large bowel were found to be enormously distended, the peritoneal coat of the ascending colon was found to be split longitudinally for about three inches. The uterus was found in a fair position and not impinging on the lumen of the bowel. The obstruction was located in the sigmoid, and was found to be a volvulus. This was corrected by rotating the bowel on its mesenteric axis, no suturing being employed. A rectal tube was inserted and gas forced through this tube. A stomach tube was also inserted to relieve the upper abdominal dis-

tention. At the upper portion of the loop involved were found two rather hard lumps of feces about the size of a marble. Patient's general condition became bad, stimulation resorted to, while abdomen was being closed. After reaction, i. e., about five hours, an enema was given, and was expelled as a brownish fluid of characteristic odor. Vomiting after this second operation became brownish, and was relieved by repeated lavage. The subsequent progress of both mother and child was normal.

#### DISCUSSION

DR. EDWARD A. SCHUMANN.—Most of us will agree the decision to re-open an abdomen after a diagnosis of intestinal obstruction is a very difficult one to reach. I believe, in the absence of peristalsis and the presence of vomiting, in the presence of severe pain, elevation of pulse rate and slight elevation of temperature, most of us fear the development of peritonitis and question the advisability of opening the abdomen. The patient is usually in a condition which does not warrant re-operation.

#### IN MEMORIAM

**ELLA B. EVERITT, M.D.**

JANUARY 24, 1922

In the untimely death of Dr. Ella B. Everitt, the Philadelphia Obstetrical Society has lost a long-valued member. Dr. Everitt had been for twenty-five years a part of the medical life of Philadelphia and a member of this Society since 1906. For twenty years she had been Professor of Gynecology at the Woman's Medical College of Pennsylvania, the college from which she was graduated, and her name will always be most closely associated with the College and its Hospital. In the many generations of students who passed through her classes she inspired a respect due not only to her ability as a teacher but also to her high professional ideals and her unswerving adherence to them. As Gynecologist-in-Chief to the College Hospital she set a consistent standard of operative technic and brought to the questions of hospital administration the powers of clear reasoning and logical deduction with which she attacked all problems. Her operating was skilful and sure, without a wasted motion. She also held the position of Gynecologist and Obstetrician to the Philadelphia General Hospital and at the moment of her death was on her way to perform an operation there.

Dr. Everitt's activities were not limited to the medical field. Her interest in education was shown by her years of service as trustee of Wilson College, her Alma Mater. Part of her time was devoted to religious work and in the midst of her busy professional life she always found a place for her Bible classes, at her church and at the Business Women's Christian League, of which she was President. She was also a member of the Board of Foreign Missions of the Presbyterian Church.

Her death has taken from the list of Philadelphia's physicians one whose life was of value to profession, community and State.

ALICE WELD TALLANT  
WILMER KRUSEN  
EDWARD P. DAVIS

NEW YORK ACADEMY OF MEDICINE  
SECTION ON OBSTETRICS AND GYNECOLOGY

STATED MEETING, HELD MAY 23, 1922

DR. WILLIAM P. HEALY IN THE CHAIR

DR. JOHN VAN DOREN YOUNG presented and described an **Oil Impregnated Laparotomy Pad.**

Some five years ago noticing this drying of "saline pads," it occurred to me that if they were oil impregnated, pads would have all the advantages of dry pads and none of their disadvantages. I have evolved the following method of preparation. Liquid albolene is sterilized by boiling, the pads are sterile and are impregnated with the oil so that the gauze fibre is covered. The mesh is empty, which leaves the pad absorptive to all fluids of the abdomen. The pad does not collapse and crush down as when wet, but it is as elastic as when dry and just as absorptive. It does not adhere to the peritoneum no matter how long it is left in contact with it, there is consequently no trauma of the endothelial cells and the postoperative pain is consequently less.

After the pads have been impregnated with oil they are put six in a deep basin, lined with a sterile towel, which is then folded over the pads and pinned, a disk of oil silk placed over the top of the basin and the whole wrapped and pinned in a second towel. The package is then sterilized in an autoclave on two successive days. When needed the outer towel is removed and the sterile basin and contents handed to the operating room nurse and placed in a basin of hot water; by the time they are needed we have a warm absorptive, elastic, non-traumatizing pad, which will not drip oil or vary the method of pad use in any way.

Stick sponges may be prepared in the same way, or may be oil impregnated immediately before use by the operating room nurse, or her assistant, their small size making this perfectly feasible.

In an emergency even the large laparotomy pads may be impregnated at the time of operation, but it is difficult to get the even impregnation of the oil, and avoid unnecessary oiling of the gloves and the operative field.

DISCUSSION

DR. DAVID TOVEY.—Dr. Young's pads would seem to prevent traumatism but pouring oil into the abdominal cavity as a few men have advocated is a very dangerous procedure. I recall an instance where the late Dr. Brooks Wells opened the abdominal cavity after oil had been poured in and found masses of slimy adhesions. I understand that at the Women's Hospital at that time, oil was used with the same results. I think that if we use oil it should be in a quantity just sufficient to moisten the pads.

DR. EDWARD W. PINKHAM.—I cannot see how any pad impregnated with oil can help being slippery. If this pad does not possess the objection that it is slippery and greasy it seems to me that it would be very good.

DR. YOUNG (closing).—I wish to emphasize the fact that this pad is oil *impregnated*. There should be no superfluous oil, no dripping, and never enough

to squeeze out. The operator soon becomes accustomed to the use of the oil impregnated pad, and if in handling them his gloves become slippery it is but the work of a moment to wipe the oil off on a moist towel.

The great advantages of a nontraumatizing, absorptive elastic pad that stays in place, and is easily removed, are apparent and far outweigh any slight inconvenience of the oil.

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DR. FREDERICK RICE read a paper entitled **Recent Efforts Tending to Reduce Mortality in Childbirth.** (For original article see page 264.)

#### DISCUSSION

DR. AUSTIN FLINT.—Dr. Rice has spoken from the standpoint of the dangers of childbirth. Of course, the dangers of childbirth can be greatly alleviated by skilful care. The answer as to the way in which this can be accomplished is by better obstetrical training. It seems to me that the training of medical students and men practising obstetrics should be largely along the lines of training in the better care of *normal* cases. Most of the obstetrical sins, as we know, are committed in normal cases. One reason for the present high mortality is that when it becomes necessary to perform an operation in the course of a delivery, the patient is not in good condition to withstand an operation, and it is often done under conditions that are not to the best advantage of either operator or patient. The woman is exhausted from ineffectual pains and lack of sleep and nervous strain. The obstetrician must be a man of very good judgment in order to select the proper time for operation. In making the selection of the best time for operation not only must the woman be considered but the child as well. It does as much harm to the unborn child to delay operation too long as to attempt to operate too soon.

Naturally a normal labor is best for the mother and child, but it is not "watchful waiting" that is important, but intelligent waiting. It requires intelligence and good judgment to know how long the mother should be left before interference. We may say that undue pressure may be a cause of infant mortality and that we can prevent this cause of mortality by the timely application of forceps. On the other hand the too early application of forceps will often cause undue compression on the head. The only way by which a man becomes competent to decide the opportune time for interference is by constant drilling in the care of normal obstetrical cases, and observing them under many varying conditions.

Another point to be emphasized is the value of intelligent prenatal care. Prenatal care was unknown at the time I began to teach. Of course one occasionally examined the urine of the pregnant woman, but intelligent, systematic prenatal care was unknown. Since we have had prenatal care there has been a great diminution in the number of cases of eclampsia at Bellevue.

Still another important point is that of omitting vaginal examinations with the object of lessening the risks of infection. The obstetrician who has had the prenatal care of a woman knows the size of the pelvis, the position of the fetus and the size of the fetus, so when the patient goes into labor he is prepared to conduct the delivery without the necessity of making internal examinations.

The mortality due to complications is a very important factor in hospital work at the present time. It is because these cases are sent in only after the complication has developed and so they may be placed under the head of "neg-

lected cases." They are sent to the hospital as a last resort, are operated upon under unfavorable conditions and are therefore bad surgical risks. If such cases can be seen earlier the complication may often be prevented, or the patient operated upon under more propitious conditions.

The education of the public is going on apace. The public is now learning that the man who takes care of an obstetrical case should be a specialist in obstetrics. The time has come when the public is not content to have a good professional man but wants a specially trained man.

The chief causes of fetal mortality are operations and hard labors, and improvement can only be brought about by better training in the conduct of normal cases, and, second, by limiting the performance of serious obstetrical operations to those who are specially trained in obstetrical operative work.

DR. GEORGE L. BRODHEAD.—There is one point in which prenatal care does not help us, and that is in the prevention of sepsis. As Dr. Flint has well said the majority of patients can be safely delivered without internal examination. But in a hospital, in spite of the fact that no internal examination has been made we see fever in a certain number of cases. Recently we conducted a series of labors in 45 negroes in whom no vaginal or rectal examination was made during labor and yet seven of these women had an elevation of temperature. In two the temperature remained above normal for a few days only. Four of the patients ran a high temperature for a period ranging from eight to eighteen days, and all recovered. One patient died of pyemia with infected varicose veins of the leg. In these cases infection was certainly not introduced from without. In my experience the negro race has less resistance than the white. We have seen a number of instances in which without any internal vaginal examination the patient has run a septic temperature. The prenatal care should be such that internal examination should rarely be necessary during labor; with a little experience rectal examination is satisfactory. A labor conducted without rectal or vaginal examination should give an uncomplicated puerperium.

DR. RALPH WALDO LOBENSTINE.—During the past year we have heard so many absurd things in connection with the Sheppard-Towner bill and the Davenport bill, that, while I did not follow all the discussion, I wish to refer to one statement that was made in connection with the figures published by the advocates of prenatal care, namely, that many of the data were incorrect. Statistics always require close scrutiny; but the fact remains that for the registration area in the year 1919, the United States showed a maternal mortality rate of 7.4 per 1000, which is high in comparison with the statistics of other countries. It has been claimed that those who were overenthusiastic in their advocacy of prenatal care, had overstated the conditions. I do not believe this to be so! In 1919 there was a decrease in the mortality rate of every kind of disease with the exception of cancer, influenza, and pregnancy. Such are the facts so far as the statistics available go and we must accept them. I would, however, differ with some of the enthusiasts in the interpretation of certain of these statistics. For instance, in Italy the maternal mortality was put down as 2.2 per thousand as against 7.4 for the United States. If you accept these figures without explanation they are absurd. We have advocated prenatal care as a certain definite need, but we often find that we are misunderstood in what we desire to do. There are certain things which prenatal care can accomplish and certain other things which it cannot accomplish. As we see it from the public standpoint and from the doctors' standpoint, education is needed in reference to the need of prenatal care. If you have not been particularly interested in the sub-

ject you will scarcely realize that there are many physicians who think prenatal care is not an important thing. From the standpoint of the public the needs are for better care at the time of labor and a plan to force people to go to a doctor earlier in pregnancy for examination. From the standpoint of the mother we should find out whether she has any pelvic abnormality or any medical abnormality as heart disease, tuberculosis, kidney trouble or a tendency to bleed. As to the question of the toxemia of pregnancy, I do not think Dr. Rice lays sufficient stress on what the nurses accomplish in the clinics and follow-up work in the home. Along these lines the work of the nurses is splendid and although I am interested in the work of the nurses, I believe that any abnormality that the nurse discovers should be reported to the doctor at once. We believe the blood pressure and albumin tests, are for most cases as reliable as any criteria one can have.

From the standpoint of the child the greatest loss of life is during the first year and the chief cause of death during the first month of life is prematurity. Second in importance as causes of death during the first month are injuries during childbirth, and syphilis. Again I say prenatal care can accomplish certain definite things for the mother and certain definite things for the child, but we have found to our sorrow that there are certain things that prenatal care cannot accomplish. There are many placenta previas and other hemorrhages that prenatal care can do much for. Dr. Flint and Dr. Rice and Dr. Beck of Brooklyn have shown what prenatal care has done in the way of lessening the incidents of eclampsia, but we have no control of sepsis that has recently been raging in hospitals and we have no control often over the ordinary accidents of labor. There are two distinct things, prenatal care is one thing and care at the time of labor is another. It is here that the reason may be found why some maternity-center statistics do not show favorable results on the surface.

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DR. JOHN VAN DOREN YOUNG read a paper entitled **Intermittent Aspiratory Hyperemia in Gynecology**. (For original article see page 280.)

#### DISCUSSION

DR. WALTER T. DANNREUTHER.—Several years ago, I employed a somewhat similar method, by using the reverse of a compressed air apparatus, but with rather disappointing results. However, I employed tips of various sizes which were manipulated by forceps, and not the large tubes that Dr. Young has demonstrated. I tried out the idea chiefly for the purpose of collecting specimens and draining the cervical glands. I cannot explain why my experience was so different from that of Dr. Young, but I found it practically impossible to get any quantity of discharge with my suction apparatus. On the other hand, I have used the suction in the treatment of menstrual and cervical disturbances with very satisfactory clinical results.

Before undertaking the treatment of cases of leucorrhea, it is necessary to determine the underlying cause, after which they may be placed in one of two great classes, relying largely upon the microscopical features of specimens taken from the cervix. I have no confidence whatever in a pathologic report which simply states "gonococci present" (or absent). We should get a report which shows a large number of mucous shreds and corpuscles, a few pus cells, and no pathogenic microorganisms, except possibly a few micrococci catarrhalis, or else one in which the pus cells predominate and pyogenic microorganisms are present. The findings in the



first group of cases represent simply an evidence of hypersecretion, while those in the second group indicate at least true cervicitis or endometritis, plus infection. We all know that the cases coming within the first category are few and far between but are the ones that are really benefited by curettage, while the others must be treated in the office and may be greatly aggravated by surgical trauma.

I should like to know how Dr. Young differentiates between cervical erosion and ectropion. Cervical erosion will, of course, respond to office treatment, but I have never succeeded in curing ectropion except by a plastic operation. It is my own practice to distinguish one from the other by making a topical application of tincture of iodine, for we know that squamous cells take the iodine stain, while cuboidal do not.

Is there any advantage in using the long glass cups instead of the short ones which I employed? Perhaps these long vacuum tubes have some virtue and advantages not possessed by the smaller cervical tips.

DR. YOUNG.—The use of the compressed air apparatus for cupping the cervix as suggested by Dr. Dannreuther, is quite in contrast to the method described in my paper. Dr. Dannreuther uses a small cup held against the cervix with an air exhaust that produces a small area of slowly increasing partial vacuum, a true cupping, while in my apparatus there is rapidly produced partial vacuum in a long tube, which gives a hammer-like blow to the cervix, this causes a cervical congestion, and a true uterine stimulation, then it is as suddenly let go and there is a return to normal in the circulation, also a muscular relaxation. This aspiratory stimulation may be repeated as desired; there is also an incidental aspiration of the cervical glands.

I suggested in my paper a combination of the cautery and aspiratory hyperemia. I, however, believe the cautery should be used with care.

This report is in the nature of a preliminary one as it is based only on 221 cases, and my observations and study have only covered two and one-half years. I do not feel that either the time or the number of cases are sufficient to make positive statements from, but my observed results have been so satisfactory that I unhesitatingly recommend it. It is an instrument for office use and as such I have found it indispensable, both in the treatment of cervical infection, and as a method for uterine muscular stimulation.

# Department of Reviews and Abstracts

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CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

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## Selected Abstracts

### Therapy of Uterine Fibroids

Béclère: Three Hundred Cases of Uterine Fibroids Treated With X-Rays. *Journal de Radiologie et d'Electrologie*, 1921, v, 449.

Of this interesting and extensive paper, only a few of the most important points can be mentioned. The menorrhagias disappeared in 294 cases. An immediate cessation of the menstruation occurred in 5 per cent; 77 per cent had one or two menstruations before the final cure; in 15 per cent menses occurred three times; in 3 per cent, monthly bleedings were noted more than three times. In all cases, a more or less marked shrinkage of the tumors took place sooner or later. In 74 out of 272 tumors which extended into the abdominal cavity, no vestige of the growth was found on bimanual palpation. These findings were elicited immediately after the last treatment. This retrogression is so constant that an abdominal tumor diagnosed as a uterine fibroid which does not recede after x-ray treatment, cannot be considered to be a fibroid. The reduction in size begins after the first series of treatments and is plainly noticeable after the second or third series. In favorable cases, the upper pole of the tumor recedes about one centimetre a week. This shrinkage is independent of the ovarian function; it may precede the suppression of the menses by one or three months, and it occurs equally promptly in women who have long been in the menopause. This fact proves a specific action of the x-rays upon the cells of uterine fibroids.

As soon as hot flushes occur, the treatment is interrupted. If, on the other hand, the hot flushes last but a short time, a recurrence of the menstrual flow and a new increase in the size of the tumor is likely to happen. Such recurrences were observed in 10 cases and necessitated a few additional treatments to be cured definitely. There were three complete failures among the 300 cases; in all three a submucous fibroid required surgical treatment. In six cases, polyps, cancers of the body, and ovarian cysts complicated the clinical picture and interfered with the success of the x-ray treatments.

The only danger from x-ray treatment is the effect upon the skin. With a proper technic, such x-ray burns can easily be avoided. Pigmentation of the skin occurs almost regularly but is only temporary. The subjective disturbances following radiation such as nausea and general malaise, the author has observed only in a very small percentage of his cases. There is no essential difference between the symptoms of the natural menopause and those of the artificial menopause induced by the x-rays. On the contrary, the radiated women seem to feel better and stronger, probably because they are relieved of the toxic substances produced in the fibroids. The sexual function is very little, if at all, interfered with.

As to the indications for x-ray treatment, the author contends that radiotherapy is indicated whenever an operation is contraindicated or considered hazardous.

Conversely, x-ray treatment is inadvisable only when an imminent danger, a pedicle twist, an acute hemorrhage or sepsis demands an immediate operation.

Compared to radium, the x-rays have a wide range of applicability. The latter may be employed even in the presence of salpingitis where radium is strictly contra-indicated. X-ray treatments, finally, are available everywhere, whereas radium is in the hands of only a privileged few.

GEORGE GELLHORN.

**Gellhorn: When to Operate and When to Use Radium on Fibroids of the Uterus.**  
Journal American Medical Association, 1922, lxxviii, 259.

Gellhorn feels that the principal field for radium is in women over 40 who have fibroids not extending to the umbilicus. It is further indicated in those who are, for some reason, poor operative risks and those who object to any form of operation.

According to the statistics of Gauss and Friedrich, the hemorrhage is controlled in 98.4 per cent and there is more or less shrinkage of the tumor in 70 to 80 per cent of the cases radiated. Gellhorn believes that the rays have a direct destructive action on the tumor cells, as mere castration would not cause the rapid shrinkage observed in some cases.

All tumors extending above the umbilicus and all large pedunculated subserous and submucous fibroids should be operated on, as well as all cervical fibroids. Suppurating, necrotic and gangrenous fibroids are unsuitable for radiation, as well as those undergoing cystic or calcareous degeneration. Co-existing adnexal disease is an indication for surgery. Gellhorn feels that radiotherapy is justified in cases of sarcomatous degeneration, provided the dose is correspondingly large.

The success in the use of radium depends upon the proper selection of cases. Gellhorn prefers radium to x-rays, but occasionally uses the two in combination. Ordinarily he employs 1200 mg. hours within the uterine cavity. This treatment he administers preferably after the menstrual period. While calling attention to the absence of any operative mortality, which is from 3 to 5 per cent, he admits that he has found it applicable in only about 60 per cent of the cases coming under his care.

R. E. WOBUS.

**Taussig: In What Cases Do Uterine Fibroids Still Require Operative Removal?**  
Journal American Medical Association, 1921, lxxvii, 357.

Taussig prefers radium to x-rays in the treatment of uterine fibroids and believes that it will eventually replace operation in most cases. However, he realizes certain very definite contraindications to its use. Among these are the following: *Size.* Tumors more than 12 cm. in diameter should be removed by the knife. *Location.* Submucous fibroids protruding through the cervix, subserous fibroids with pedicle, cervical fibroids and intraligamentous fibroids should be operated on. *Degeneration.* Rapidly growing tumors, calcified or necrotic fibroids and those complicated by malignancy are unsuitable to radiation. *Age.* Not age, but the desire for children and the preservation of menstruation, are indications for myomectomy or hysterectomy. *Complications.* Pyosalpinx and ovarian cysts make operation imperative.

R. E. WOBUS.

**Wiener: The Present Status of the Treatment of Uterine Fibroids.** New York Medical Journal, 1921, cxiv, 400.

The author presents his conclusions as follows: 1. Many fibroids require no treatment whatsoever. 2. Radiotherapy is a more radical method of treatment than operation because it destroys the ovary. 3. The contraindications to radiotherapy

are youth of the patient, large tumors, pain as a symptom, inflammatory conditions of the adnexa, submucous and subperitoneal pedunculated growths, ovarian tumors and carcinoma of the fundus. 4. Radiation should always be preceded by diagnostic curettage. 5. Indications for radiation: as a palliative measure in patients with serious organic disease; small uncomplicated fibroids, where bleeding is the sole symptom, and the patient is approaching the menopause. 6. The indiscriminate use of radiotherapy in the presence of unsuspected and undiagnosed complications will lead to a high mortality. 7. Surgery is the more conservative method of treatment, especially as regards the ovary. 8. Surgery takes care of the pelvic complications. 9. Myomectomy should be more frequently employed; it conserves the function of menstruation, and occasionally permits of future pregnancy. 10. Surgery has a mortality of from one to two per cent, including cases with severe complications—figures entirely comparable to those of the operation of internal appendectomy.

MARGARET SCHULZE.

**Montgomery: Indications for the Surgical Treatment of Fibroid Tumors of the Uterus.** *Illinois Medical Journal*, 1921, xl, 325.

Necropsy statistics at the Massachusetts General Hospital and the Johns Hopkins Hospital show that 28 per cent of all women over thirty-five have fibroids. The mere presence of this condition is not an indication for operation. The most frequent symptom demanding interference is hemorrhage and its resulting anemia. Until recently this was considered sufficient reason for operation. Kelly has shown that in uncomplicated cases, radium offers the best means of treatment for this condition. Kelly claims that if radium is insufficient, its use in no way interferes with subsequent operation.

The author feels that surgical treatment is preferable in robust women under fifty, with hemorrhage and growing tumor. The most pressing indications for operation are sepsis and acute abdominal pain caused by tumor pressure in the pelvis. Severe pressure symptoms of any kind require operative relief. Noble and others have shown that over 2 per cent of the fibroid tumors removed are complicated by carcinoma of the cervix. Complete removal, therefore, would seem to be the operation of choice in parous women. With the judicious selection of cases for operation and radiation, better results will be obtained than through the routine use of either measure alone.

H. W. SHUTTER.

**Clark and Norris: End-Results in 232 Hysteromyomectomies.** *Surgery, Gynecology and Obstetrics*, 1922, xxxiv, 509.

This analysis was instituted in order to shed some light on the fate of conserved ovaries as well as the discomforts produced by their removal. The authors reach the following conclusions:

Hysteromyomectomy is productive of excellent end-results whether or not ovarian conservation is practiced, but better end-results and greater comfort to the patient can be secured by conserving the ovaries. While one ovary is better than none, it is best to conserve both, if possible.

Conserved ovaries seldom give rise to subsequent trouble. In 171 cases in which a total of 261 ovaries were conserved, it was not necessary to re-operate for ovarian degeneration. That conserved ovaries, however, may give rise to subsequent trouble, is conceded. The successful conservation of ovaries depends upon the condition of the ovary at time of operation, the conservation of adequate blood supply and the retention of the ovary in its normal position. It may be better to sacrifice a doubtful ovary than to conserve it.

When both ovaries are removed, the severity of menopause symptoms depends more upon the temperament of the patient than upon her age. In most cases the symptoms, even in young women, are not severe. Conserved ovaries functionate and when the menopause does occur in those cases in which the ovaries are conserved, it is more gradual and less severe than in the usual surgical menopause.

R. E. WOBUS.

**Seitz: Experience with X-ray Therapy in Genital and Extragenital Sarcoma.** *Deutsche Medizinische Wochenschrift*, 1922, xlviii, 345.

While the possible existence of sarcomatous degeneration in a fibroid has been given as an argument against the routine treatment of these tumors by the x-ray, Seitz has come to the conclusion that even the demonstrated presence of sarcoma is no contraindication to radiation. In such cases however the dose should be double that usually administered for fibroids.

Of 4 cases which were positively diagnosed as uterine sarcoma by exploratory laparotomy and histological examination, one case was hopeless from the start and died soon afterwards. The second case was in perfect health for 3½ years and then died from a metastasis in the region of the stomach. Two are free from recurrence after a period of 5 years. Following operation, 20 per cent were alive from 3 to 5 years according to statistics collected by Veit, while of Seitz's later cases treated by x-ray, all are at present well and free from recurrence. Of these, 3 cases were treated 3 years ago and 7 cases 2 years ago. Of 15 cases in which sarcomatous degeneration of fibroids was assumed but not positively diagnosed, 13 are alive after periods of from 2 to 4 years.

Of 4 cases of ovarian and other abdominal sarcoma, 2 died soon after radiation, one lived three years and another is alive and well after 4 years.

During the war, Seitz radiated 97 sarcomatous tumors in soldiers. Some of these had been previously operated upon, 26 having metastases and being considered hopeless from the start. In all cases there was a temporary improvement and 33 per cent of the total number are alive from 2 to 3 years after radiation.

These results incline Seitz to the belief that, even at the present time, proper radiation offers a better prospect of cure in sarcoma than operation. R. E. WOBUS.

**Ross: Asthma and Radium Menopause.** *British Medical Journal*, 1922, No. 3184, p. 12.

The author in a short article, including the citation of some cases, draws the following conclusions: (1.) One application of radium may bring on the menopause and may be substituted for operative procedure. (2.) The method may cause distress and even dangerous results. (3.) Ovarian extract should be given to counteract unpleasant symptoms from the sudden menopause. (4.) He advises the use of ovarian extract in illnesses at the time of menopause which are probably due to ovarian insufficiency. (5.) Asthma may be due to deficiency of internal secretion. Ovarian extract is occasionally beneficial.

F. L. ADAIR.

**Werner: Influence of Deep Radium and X-Ray Treatment on the Process of Reproduction.** *Muenchener Medizinische Wochenschrift*, June 24, 1921, p. 767.

Writers seem to agree that deep radiation does not inhibit the power of conception, does not disturb parturition, and does not predispose to abortion or premature labor.

Much more uncertainty exists in regard to the fate of the offsprings of women

who have been rayed. Doederlein and later Kroenig pointed out the danger of partly damaged ova becoming impregnated and giving rise to varying degrees of monstrosities. This was further strengthened by the experimental work of Hertwig who rayed spermatozoa and non-impregnated as well as impregnated ova directly. Fraenkel applying this to humans was able to demonstrate a constant general underdevelopment as a result. On the other hand Nuernberg's more recent investigations point to just the opposite conclusion. He concludes that some ova are so badly damaged in the ovary that they cannot continue to develop, while others are not changed at all, and so may give rise to a normal fetus. Such ova as may be only partly damaged and might give rise to monstrosities escape our observation, probably by leading to very early abortion.

The author presents the results obtained in a series of 1512 cases treated by radium or x-ray for essential metrorrhagia (990) and myomata uteri (552). Out of this series 24 pregnancies subsequently occurred. Of these, 13 resulted in full term pregnancy with living child, 1 in four weeks premature labor, 9 in abortion from the second to the fifth month, and one pregnancy was terminated by removal of the myomatous uterus.

Two of the full-term pregnancies with living babies, three of the abortion cases and the case of interrupted pregnancy (hysterectomy) had become pregnant after an amenorrhea lasting for several months produced by x-ray or radium treatment. The remaining pregnancies occurred in women who, under treatment, had reached a stage of oligomenorrhea.

Not counting the interrupted pregnancy (hysterectomy) 14 of the 23 cases ended with delivery of living child while 9 aborted. Of the 9 abortions, 3 were induced, 6 were spontaneous; this leaves a proportion of 2.3 births to one abortion while the relation in Germany is as 5:1.

All labors were normal as were the puerperal periods. Eclampsia developed in one case during labor. Early pregnancy also was normal.

The new born children were normal in appearance and negative to examinations. Of the 14 babies born alive, 4 have since died. The premature died in 8 hours of general weakness, the other three of intercurrent disease—pneumonia, bronchitis and measles at 9, 10 and 15 months. The remaining 10 have been carefully observed. They range in ages from 2 months to 8 years. Six of these (2 months to 3 years) seem normally developed physically and mentally, 4 are between 6 and 8 years, 3 of these in spite of exceptionally good initial development became deficient in the 4th and 5th year in weight and length to an extent which can be expressed as 16 per cent and 8 per cent respectively when compared with the normal. They are even yet one kilogram underweight, and one is 8 cm. below the normal in height. All of these children have had an ample diet.

In two further cases treatment was continued after pregnancy had originated. The first woman became pregnant after the first treatment and the condition not being diagnosed the treatment was repeated 3 times. In the second case with a mistaken diagnosis of myoma uteri 4 intra-vaginal treatments of 30-40 mg. of radium for 24 hours each were given. The first woman went to full term, delivered normally of living child fully developed and apparently entirely normal.

The second woman went overtime 4 weeks and delivered of an under-developed baby, 45 cm. long, 1950 grams and manifestly under-nourished. The first baby now 6 years old is 3 kilograms underweight; the second baby—3¾ years—is about one year behind normal in its development.

In general, the author concludes, pregnancy can occur after x-ray and radium treatment of dosages in vogue, even when the stage of amenorrhea has been reached and in neither the course of pregnancy nor in labor is any special danger to be

anticipated. A definite tendency to abort seems to exist in these cases. While the new-born presents no apparent damage or mal-development, later on, development appears to be retarded.

S. B. SOLHAUG.

**Stenger: Pregnancy and Birth after X-Ray Treatment of the Myomatous Uterus.**  
*Schweizerische Medizinische Wochenschrift*, 1921, li, 1084.

The question is raised as to whether children, normal in physical and mental development may be born to a mother with a myomatous uterus after extensive x-ray treatment for the myomata. The author cites cases where apparently healthy children were born after the uterus had been treated for myomata almost as large as a fetal head and the myomata had disappeared. The explanation offered is that probably impregnation had taken place before treatment or close to it or else that some of the primordial follicles were immune to the dosage used either intrinsically, or that they were buried more deeply in the ovary and were not reached. He suggests that amenorrhea may come on a month or two before actual sterilization has taken place. In the event of other complications such as Basedow's disease the dosage may be varied so that actual sterilization does not take place and this opens up the possibility of temporary sterilization in such conditions as pulmonary tuberculosis, mental diseases or kidney affections. If the patient be already pregnant there is no definite reason to expect either an abortion or an imperfectly formed child. Apparently the best time to attempt temporary sterilization is in the first half of the intermenstrual period and the treatment to be at a single sitting. The methods are too uncertain as yet to be able to determine the length of such temporary sterility.

A. C. WILLIAMSON.

**Aschenheim: Danger of X-Rays to Fetus.** *Archiv. für Kinderheilkunde*, 1920, lxxviii, 28.

The child, described by the writer, was three and a half years old, microcephalic with pronounced ophthalmic anomalies (microphthalmos, cataract, atrophy of both optic nerves, and bilateral chorioretinitis). Mother not syphilitic. In the absence of all other possible etiologic factors the author believes that two x-ray treatments administered during the first month of pregnancy may be held responsible for the defects of the child. In his opinion, this conclusion seems particularly justified by the eye changes.

EHRENFEST.

# The American Journal of Obstetrics and Gynecology

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## Original Communications

### THE UTERUS AFTER CESAREAN SECTION\*

BY EDWARD P. DAVIS, M.D., PHILADELPHIA, PA.

AS CESAREAN section has become established as one of the standard and important operations of obstetric surgery, we have come to the stage of studying, not only the best method of performing the operation, but also the after-history of patients upon whom the operation has been done. Not only must the patient recover from the operation if we are to be successful and her child also survive, but she must be left in such a condition that if her pelvis is of sufficient size, she may give spontaneous birth after a subsequent pregnancy. Another problem which enters the field of cesarean section is the question of birth control. Cesarean section is often performed for conditions which make spontaneous labor on the part of the patient impossible if a living child is to be secured. Unless the pregnancy for which the first operation is done is to be the last, each succeeding pregnancy means additional danger. Must each cesarean operation terminate in sterilization, or has the patient a fair prospect if the pelvis is sufficiently large, of being successful in spontaneous labor in subsequent pregnancies? In addition to this problem, birth control presents itself in another phase. The obstetrician is often called upon to treat multiparæ who are near the final limit of healthy child-bearing. Many of these are women in straitened circumstances, who have as many and some of them more children than they can properly rear. Many have reached the stage of physical degeneration where future pregnancies will become progressively dangerous. Under these

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\*Read at the Forty-seventh Annual Meeting of the American Gynecological Society, May 1 to 3, 1922.

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NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."



conditions, may not the performance of cesarean delivery be followed by sterilization? This is to be so done as to remove practically all of the pelvic generative organs, hasten a menopause and relieve the woman of the dangers of disease which often arise after the age of child-bearing. The condition of the uterus in these patients is an important factor in deciding these questions. Where sterilization is not effected and the patient elects a possible future pregnancy the method of suture of the uterus is of paramount importance. The writer's paper is based upon his experience in these matters, and he would endeavor to show the actual condition of the uterine muscle after cesarean operation.

Much attention has recently been called to the danger of rupture of the uterine scar after cesarean section. We are now familiar with the statistics of Holland and with the review which British obstetricians have given to the subject of cesarean section. From this contribution to the literature of the subject it may be concluded that where catgut is used to close the uterine muscle in cesarean section, that there is danger of rupture in subsequent pregnancy of about 4 per cent. This is true in cases where the classic celiohysterotomy has been done. Where silk has been used the danger of rupture is less, while it is thought that the ideal suture material would be silk-worm gut.

To understand the causes which lead to rupture of the uterine scar after cesarean section, one must revert to the conditions normally present after the uterus is emptied. By autolysis the uterus undergoes rapid diminution in size, bulk and area. Intermittent contraction and retraction of the uterine muscle is essential. If to this activity there be added the destructive agency of bacteria, greater in number than those normally found in the uterus, and if these bacteria gain unusual access to the placental site, an infective process is added to autolysis. The result of these processes is to soften the uterine muscle, cause its more or less rapid absorption, and where infection is present, to have bacteria reproducing these constantly, and finding their way along lymphatics to adjacent tissues. The resistance of these tissues results in the formation of adhesions, and if the infective process bursts through these, fistulae may develop.

A suture material placed in such an organ as the uterus will disappear through the action of cellular elements, unless it be impervious and resisting. Hence if the uteri be examined where silk has been used in closing and infection has not developed, no trace of the silk may be found. Catgut disappears much more rapidly with the unfortunate addition of the rapid loosening of the knot in the suture. From this cause fatal postpartum hemorrhage has developed. Where infection occurs the natural absorption is prevented, the stitchknot becomes a foreign body, and as bacteria make their way through the

tissues, a fistula is formed through which the foreign body may be expelled.

While the choice of suture material is important, we know that in the classic operation the efficient and accurate closure of the uterine muscle is indispensable; while methods of operation may differ, this must be accomplished.

It is a general principle of surgery that rapid and complete union in wounds is not to be expected in patients whose general condition and power of resistance are greatly vitiated. This holds good in cesarean section, and the obstetrician may be called upon to effect delivery in cases where the general condition of the patient is so bad that it is unsafe to suture the uterus and allow it to remain. This would limit the choice of operation to embryotomy or hysterectomy. Not only could prompt and successful union not be expected but should a subsequent pregnancy develop such a condition renders any form of delivery especially dangerous. Rupture of the uterus may occur during embryotomy, version or any manipulation where the membranes have long been ruptured, and the uterus has contracted and retracted upon the body of the child.

Cesarean section by incision through the lower uterine segment is said by those who practice it to be less dangerous for subsequent pregnancy. Our experience is not up to the present time sufficient with this operation to justify accurate comparison with the older and classic section. So far as the experience of the writer is concerned, he has on several occasions operated upon patients upon whom the operation by the low incision had previously been done. In two of these cases adhesions had formed so dense and resisting as to render the action of the uterus in labor inefficient and delayed, preventing a proper presentation and making inevitable the second delivery by section. It is greatly to be hoped that this method of operating may ultimately prove of definite advantage, both at the time of operation and in the patient's subsequent history.

The writer has had several opportunities to examine the uterine scar after the classic cesarean section. The second delivery of these patients was accompanied by hysterectomy; and hence the body of the uterus was available for study. All of these patients had been operated upon by the same method, namely, the turning out of the uterus from the abdominal cavity, incision through the expulsive segment, the emptying of the uterus and, in suspected cases, packing of the cavity. Uterine muscle was closed by buried silk sutures, the peritoneal covering of the uterus with catgut. In none of these cases had septic infection developed after the first operation. In those who are allowed to remain in the Maternity sufficiently long, a very fair degree of convalescence has been obtained. These five patients were married Caucasian women, the wives of artisans, caring for

their children and doing the housework. They belong to that class of persons in the community upon whom the burden of life falls especially heavily. In none of them was there evidence of syphilis, alcoholism or other especially complicating features. The cases are as follows:

CASE 1.—White, aged 30. Cesarean section eight years previously by myself, by the method described. The child lived for six months, dying from some cause not clearly stated. Five years after this the patient had twins by spontaneous labor. She was admitted to the Philadelphia General Hospital in the service of Dr. E. A. Schumann and found to be pregnant about eight months. Blood pressure 154-68, pulse 122. Pelvic measurements practically normal but patient was very obese and examination was difficult. There was no engagement of the presenting part. Urine showed albumin and casts, and there was marked swelling of the legs. The membranes ruptured early and a feeble attempt at labor developed with the head presenting. Supravaginal hysterectomy was performed by Dr. Schumann and very extensive adhesions found between bowel, omentum and anterior uterine surface. The child did well after birth. The patient's convalescence was complicated by nephritis and superficial wound infection.

On examining the body of the uterus removed there was a poorly defined furrow on the anterior fundal surface marking the line of incision at the first cesarean section. Microscopic examination of this area showed in the line of the scar, loose connective tissue and a highly vascular condition with widely dilated blood vessels. In the uterine muscle adjacent to the scar the muscle bundles were placed irregularly in the vicinity of the scar. The scar, however, was sound and was holding firmly.

CASE 2.—Aged 41, married at 19, who had had nine pregnancies, two of which ended in abortion. In 1914 the writer had performed section upon this patient and since then she had one child born by forceps. A section was done for placenta previa and followed by uninterrupted and normal recovery. The patient had come to the Clinic of the Jefferson Hospital complaining of malaise and showing old lacerations and relaxations. She had been fairly nourished but had suffered from more or less privation and poverty. Dr. Anspach performed trachelorrhaphy, anterior and posterior colporrhaphy, excision of the adherent omentum, release of adhesions and supravaginal hysterectomy. The body of the uterus taken from this patient was apparently normal. There was a moderate degree of subinvolution and on microscopic examination sections taken transversely across the anterior surface of the uterus and across the scar, showed everywhere a muscle wall practically normal in appearance. There was some slight hypertrophy of the muscular tissues. Blood vessels were large and numerous, but at no place could scar tissue be seen. The endometrium showed in some portions cystic endometritis and one small area of decidual tissue was seen. The specimen gave no evidence of an operative scar. This case illustrates the fact that a multipara, under worse than average conditions of nutrition and hygiene, subjected to abdominal cesarean section for placenta previa, made a complete anatomical and physiological recovery, giving birth subsequently to a child with the help of forceps and required operation only to repair the lacerations and injuries following delivery through the vagina.

CASE 3.—Multipara, aged 29, who previously had five labors including one forceps delivery and one cesarean section for placenta previa. This patient was

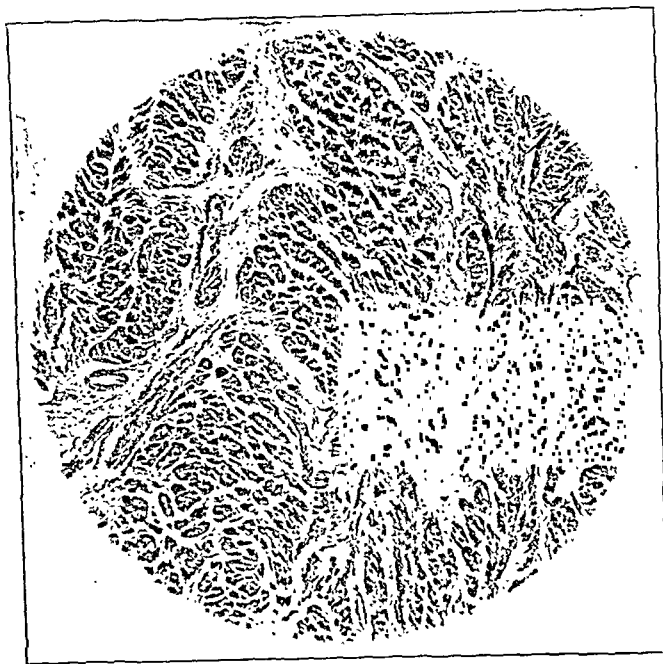


Fig. 1.—Case 1. Mrs. S. Section from cesarean uterus taken transversely across anterior surface, showing myometrium practically normal, numerical hypertrophy of slight degree and blood vessels large and numerous; no trace of scar.

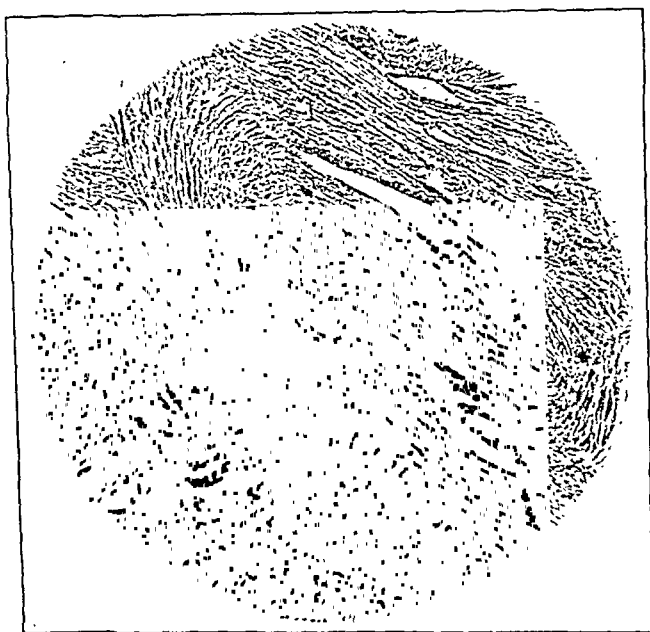


Fig. 2.—Case 1. Mrs. S. Cesarean uterus with normal uterine muscle and no trace of scar.

in the out-patient service under the care of senior students and instructors. She went into spontaneous labor and continued for a short time when progress ceased. There was a breech presentation but the condition seemed favorable for spontaneous birth. She became unduly restless with difficulty in breathing but without shock. She had vague abdominal pain without bleeding. On palpating the abdomen it



Fig. 3.—Case 2. Mrs. V. Section through uterine scar showing a group of widely dilated blood vessels.



Fig. 4.—Case 2. Mrs. V. Section through uterine scar showing irregular placing of muscle bundles with increased muscularity.

seemed as if a portion of the child could be felt with unusual ease through the abdominal wall, it was suspected that rupture of the uterus was developing. The patient was brought by ambulance to the Maternity and abdomen opened as soon as possible. There were no adhesions but at the upper extremity of the scar the tissue of the uterine fundus had ruptured. The head of the fetus was protruding and the shoulders had partially emerged from the uterus. Membranes



Fig. 5.—Case 3. Mrs. C. Section at edge of uterine rupture showing thinned out and torn muscle fibers.

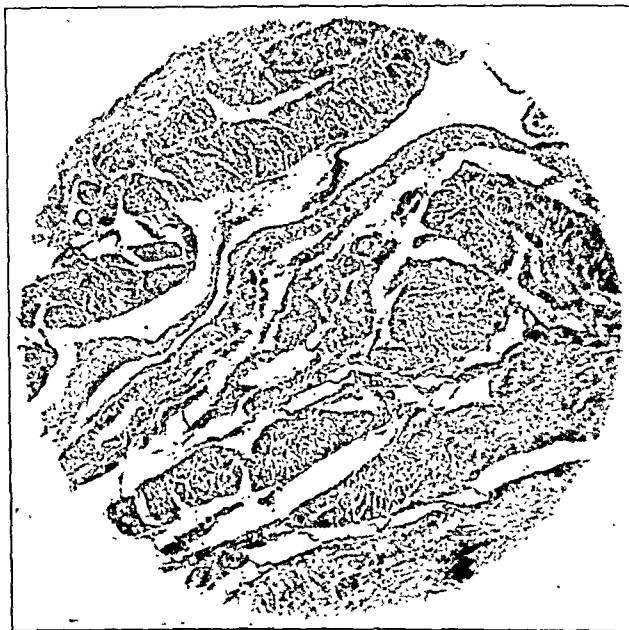


Fig. 6.—Case 3. Mrs. C. Section near line of rupture of uterus, showing thinned out muscular bundles with several small hemorrhages.

were unruptured. The child, a female, weighing seven pounds was dead. Hysterectomy was performed with dropped stump without drainage, the mother making a good recovery and leaving the Maternity in twenty days.

It is interesting in this case to note that rupture did not occur through the scar, but beginning at the upper extremity of the scar the rupture extended through the fundus. Evidently a process of autolysis had developed which had greatly

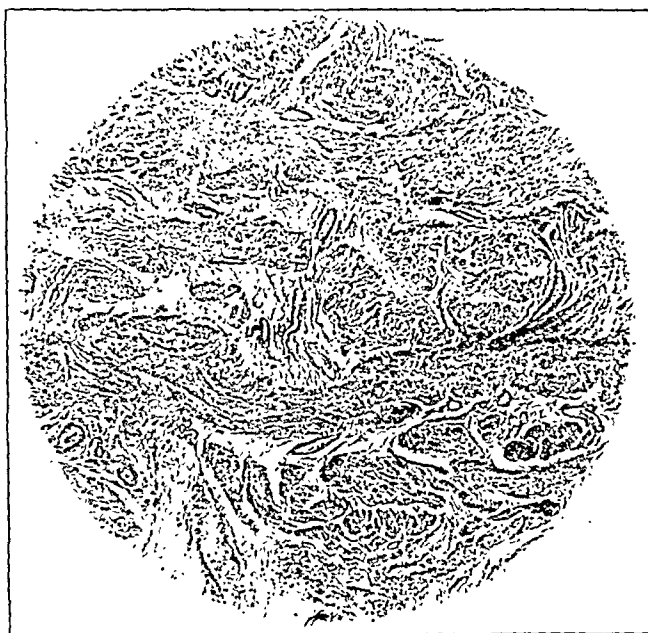


Fig. 7.—Case 4. Mrs. M. O. H. Rupture of cesarean uterus in beginning labor, marked fatty degeneration and atrophy of uterine wall.



Fig. 8.—Case 4. Mrs. M. O. H. Ruptured cesarean uterus, marked fatty degeneration with atrophy of uterine muscle and occlusion of vessels.

softened the uterine muscle at this point, possibly the pressure of the fetal head had something to do with this result. So, far from the scar being the weakest place in the uterus, it was evidently stronger than the tissues at the fundus. Microscopic examination showed thinned out and torn muscle fibers with several small hemorrhages into the muscle substance.

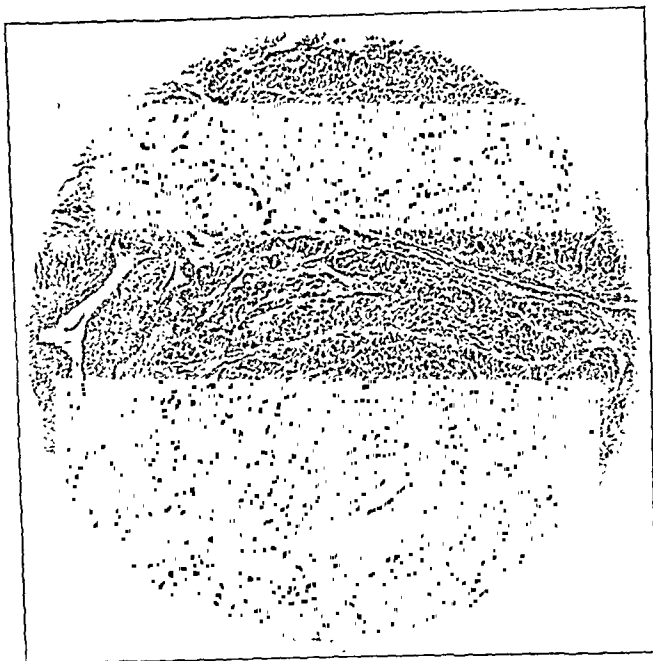


Fig. 9.—Case 4. Mrs. M. O. H. Rupture of cesarean uterus in beginning labor from fatty degeneration of uterine muscle. Vessels occluded, "moth eaten" appearance.

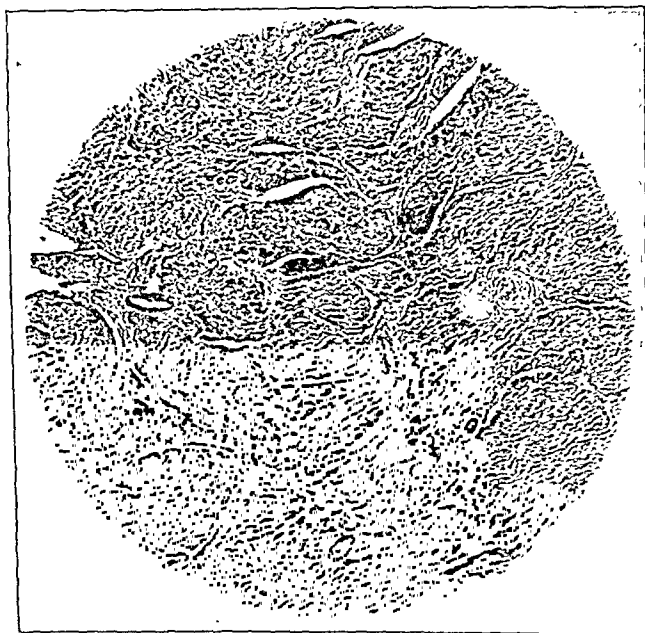


Fig. 10.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, fibrosis and atrophy of uterine muscle.

CASE 4.—A Polish woman who had lost several children in difficult labors and had been delivered by abdominal cesarean section because of disproportion and failure of mechanism in labor. She was brought in after a number of hours of labor with examinations made by others than the Staff of the Maternity. During her convalescence from section she had some elevation of temperature but nothing



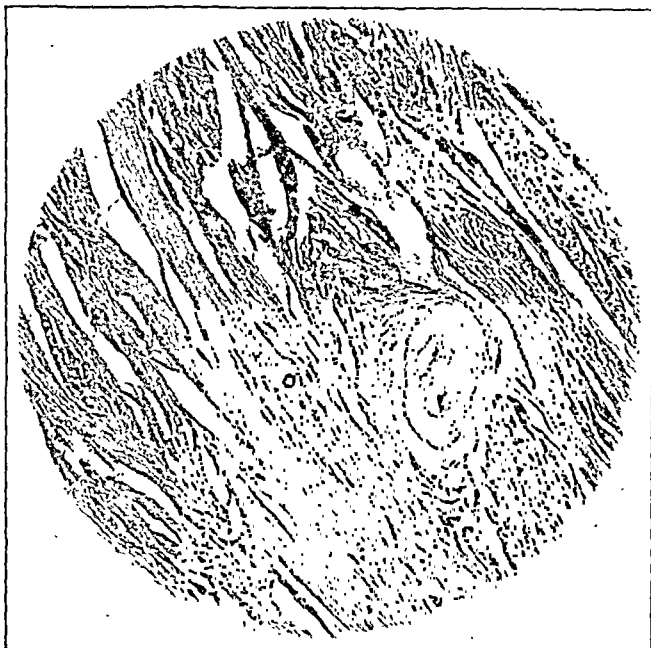


Fig. 11.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, thickening of blood vessels, fibrosis and atrophy.

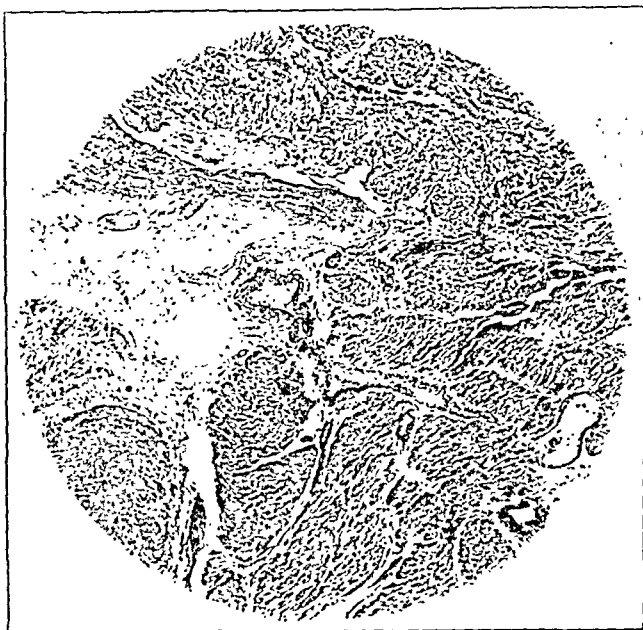


Fig. 12.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, fatty degeneration of uterine muscle.

which indicated a severe septic process. She had reached the last week of her convalescence when her husband insisted upon taking her home against the advice of the medical staff. About two years afterward she returned in the pregnant condition in very bad physical state. She had been habitually overworked and underfed and although ordinarily a stout woman, her tissues were exceedingly flabby and lacking in tone. She was told that she must come into the Maternity



Fig. 13.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, infiltration of leucocytes at junction of placenta and uterine wall.

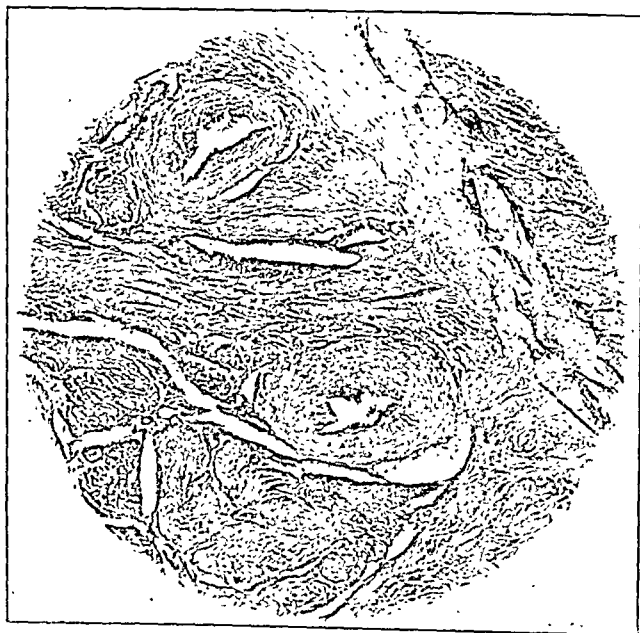


Fig. 14.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, marked thickening of blood vessels.

early in the last month of her pregnancy to receive appropriate treatment with the hope of avoiding further operation. This the patient promised to do but her husband prevented her from coming as he wished her to do the house work at home. She was brought to the Maternity by a physician who had been called to attend her. The patient had been taken in labor and after a few pains developed serious



Fig. 15.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, infiltration of leucocytes at junction of uterus and placenta.



Fig. 16.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, uterus and placenta, cellular infiltration.

shock with some hemorrhage. The physician who saw her at the house diagnosed rupture of the uterus and brought her immediately to the hospital. On examination the patient was profoundly shocked, fetus could be clearly made out in the abdomen. An emergency section was done as soon as possible, so desperate was the patient's condition, that all that could be done was extract the fetus and

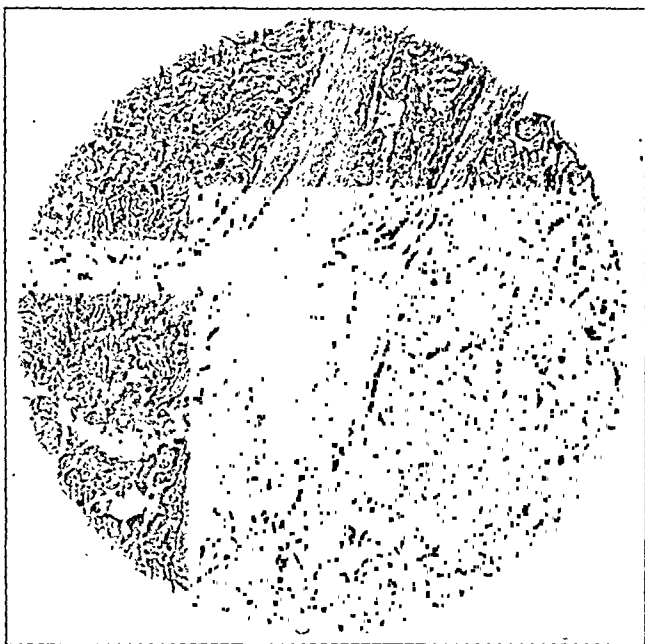


Fig. 17.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, placenta showing fibroblastic proliferation.

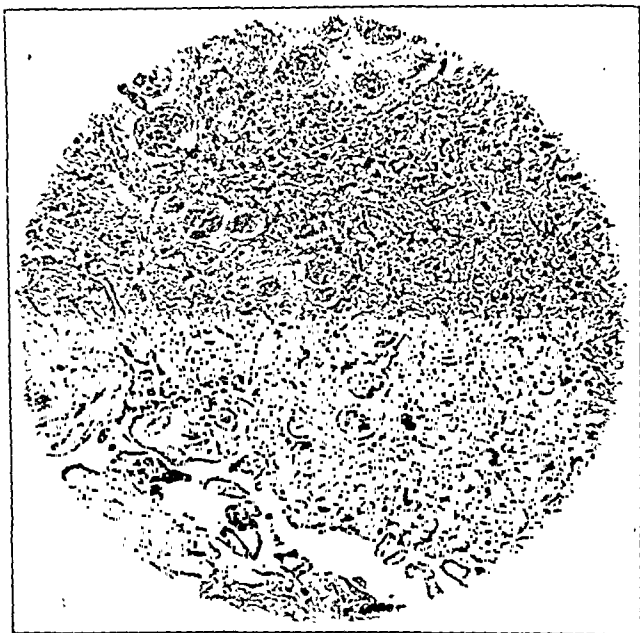


Fig. 18.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, placenta showing occlusion of vessels, fibroblastic changes.

appendages when the patient died, the child was dead. Examination of the uterine body showed fibrosis uteri, atrophy of the uterine muscle with marked fatty degeneration.

CASE 5.—A multipara aged about 43, who had given birth to several children spontaneously and had been the main support for some years of her family. Her



Fig. 19.—Case 5. Mrs. M. I. T. Cesarean section, placenta showing marked fibrous change.

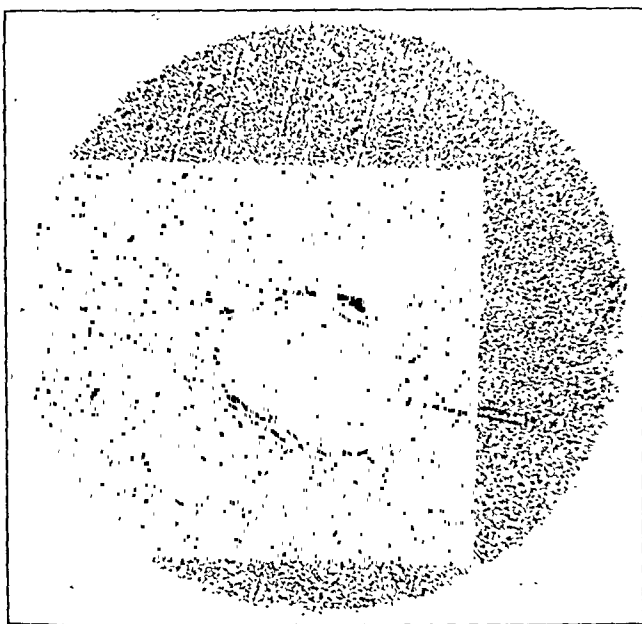


Fig. 20.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, fetal liver normal.

husband had been in ill health and she had succeeded in rearing her children well and caring for the family. A section had been done several years previous for placenta previa followed by complete recovery. The patient came to the Maternity in a highly toxic condition, the urine showed albumin and casts, blood pressure abnormal. The patient was poorly nourished and she and her husband requested that with the delivery of the child sterilization should be performed. She was accordingly delivered by elective section without labor, followed by supra-

vaginal hysterectomy, removal of the tubes and ovaries and appendix. During the operation the patient received an intravenous saline transfusion and passed through the operation in very fair condition. About eight hours after she was taken with sudden and severe dyspnea with great distress, from which she rallied under stimulation. Immediately following the right arm and hand became swollen, dark in color and cold, external heat was at once applied but dry gangrene developed in the thumb, index and portions of the second finger of the right hand. The patient went through a tedious but very fair recovery. She was seen in consultation by a surgeon and by an anatomist. The circulation in the arm became re-established and in the greater portion of the hand. She was transferred to the surgical department where the gangrenous portions of the thumb and fingers were amputated. Although crippled by the condition of the hand the patient is able to be about and do considerable work. The pelvic condition is good. Her child did not long survive delivery and died apparently from inanition.

The specimen in this case was sent to the pathologist without diagnosis and no clinical history was appended and this point is of interest as will later become apparent.

On microscopic examination of the tissues fibrosis uteri with atrophy of muscle bundles was found but the blood vessels in the uterus and in the placenta and the tissues at the junction of the placenta and uterus showed great thickening in the walls, and a very abundant infiltration with round cells.

The pathological condition was that of marked toxemia and the pathologist knowing nothing of the previous history, strongly suspected syphilis. Accordingly a very thorough search was made for the spirochaeta and this search was unsuccessful. The Wassermann reaction in the patient had been negative. The case is a most interesting example of the condition of the uterus in advanced toxemia. Grafted upon the fibrosis uteri and atrophy of muscle bundles which develops in poorly nourished multiparae, we have the evidence of occlusion of blood vessels and extensive round cell infiltration. The liver of the fetus was normal and there was no reason whatever to suspect a specific element in the case.

These cases illustrate the following facts of considerable clinical importance:

The method of performing cesarean section in the first operation on these patients consisted in closing the uterine muscle with silk and peritoneal tissue with catgut. Cases that had been examined outside of hospital, had been long in labor and brought in as emergency cases, were further treated by packing the uterus with iodoform gauze with the hope of averting serious hemorrhage and infection. This method was successful.

So far as rupture of the uterus in subsequent labor is concerned, in one case the uterine muscle ruptured but the scar remained firm and was stronger than the uterine muscle. In the second case, the uterus was the site of such fatty degeneration, that extensive rupture occurred as soon as labor began. This patient was given no opportunity to recover from her previous section and she was denied the benefit of hospital care during the last month of her pregnancy.

In all of these multiparae the degenerative processes which inevi-

tably occur in multiparae without proper care in their pregnancies and labors was present, namely, fibrosis uteri and atrophy to some extent of muscular tissues. In the patient toxic at the time of operation, fibrosis and atrophy were present but in addition we have the occlusion of blood vessels by emboli and thrombi and marked round cell infiltration at the junction of the placenta and uterus. The multiple embolism in the case of a toxemic patient is an unusual but natural illustration of the pathology of toxemia.

The writer believes that in this class of cases the evidence he presents strengthens the arguments for birth control by elective hysterectomy at term. These women had born children with difficulty and had done their utmost to rear these children at the expense of their own health and in one instance at the expense of life. Under these conditions and circumstances, the writer believes that such patients should be spared the dangers of further parturition by elective hysterectomy, no more practical application of birth control can be suggested. It should be the aim of obstetric science to relieve a mother who has done at least her share, from danger to her own life and also the risk of possible degenerative disease in the genital tract.

250 SOUTH TWENTY-FIRST STREET.

(For discussion, see p. 415.)

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## THE EXTENT OF THE RENAL LESION IN THE TOXEMIAS OF PREGNANCY\*

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A METHOD has recently been developed at the Stanford School of Medicine which measures the amount of actively functioning renal tissue in the living kidney.<sup>1</sup> The method is based on the observation that under certain special conditions the function of the kidney is limited by, and becomes a measure of, the quantity of effective tissue it contains.

These conditions comprise: first, the application of strain, so that all the functioning tissue present is called upon to exercise its maximum capacity; and second, a constancy in the environment of the organ, so that various factors which have a specific stimulating or inhibiting effect on the functioning tissue, are excluded. Strain is applied by administering by mouth large amounts of urea and water. The second requirement is met by abstention from food and by delay-

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\*Read at the Forty-Seventh annual meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

ing the measurements until three hours after the urea and water have been taken.

Two measurements are required: first, the amount of urea excreted in one hour's urine, and second, the amount of urea contained in 100 c.c. of blood removed at the middle of the period of urine collection.

Chart I shows that in the same individual, that is, where the amount of renal tissue remains constant, the amount of urea in one hour's

**THE UREA IN ONE HOUR'S URINE VARIES DIRECTLY WITH THE  
UREA IN 100 C.C. OF BLOOD**

WHEN THE AMOUNT OF RENAL TISSUE IS CONSTANT (I.E. IN THE SAME INDIVIDUAL)

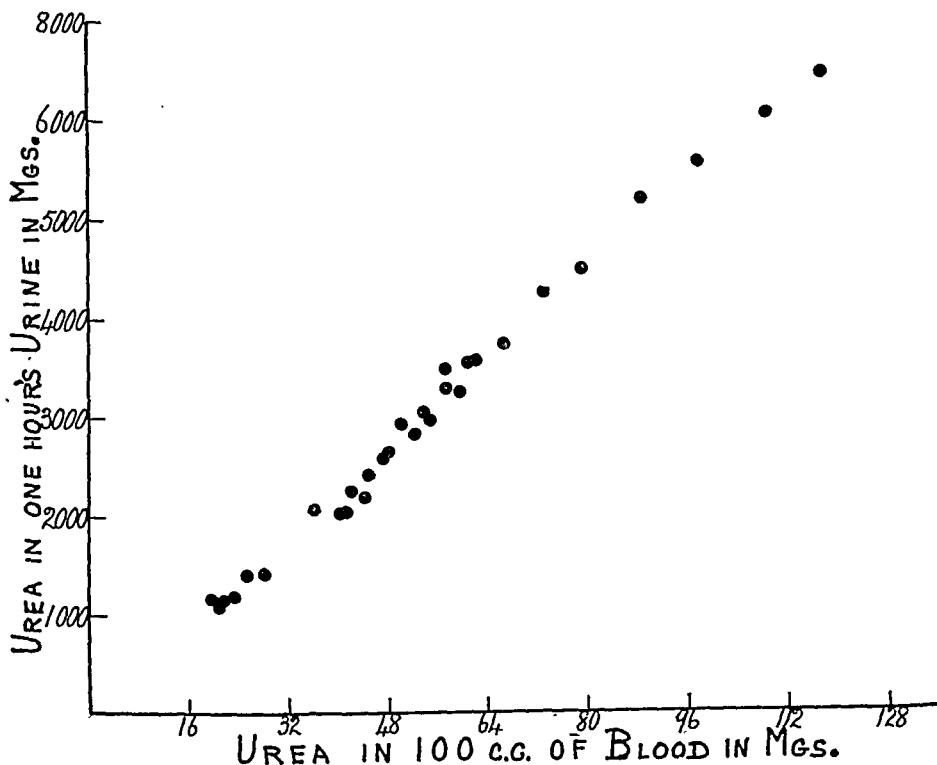


Chart I.

urine is directly proportional to the amount of urea in 100 c.c. of blood. The amount of urea in the blood, which is shown on the abscissa, was varied by administering successively larger and larger quantities of urea. It will be noted that under these special conditions with every increase in the blood urea concentration there is a proportionately equal increase in the amounts of urea excreted in one hour's urine, which is measured on the ordinate. The measurements were made on a normal adult man.

Chart II shows that in different individuals, that is, where the



amount of renal tissue varies, the ratio:  $\frac{\text{urea in one hour's urine}}{\text{urea in 100 c.c. of blood}}$

which indicates the number of times the urea in one hour's urine exceeds the urea in 100 c.c. of blood, is directly proportional to the weight of renal tissue. The measurements were made on rabbits which were killed after the test so that the weight of both kidneys could be obtained. The kidney weight is measured on the abscissa.

It will be noted that as the weight of the kidney increases there is a proportionate increase in the magnitude of the ratio which is measured on the ordinate. From this and other experiments, it is

concluded that the ratio:  $\frac{\text{urea in one hour's urine}}{\text{urea in 100 c.c. of blood}}$  equals the

THE RATIO:  $\frac{\text{UREA IN ONE HOUR'S URINE}}{\text{UREA IN 100 C.C. OF BLOOD}}$  VARIES DIRECTLY WITH THE

WEIGHT OF RENAL TISSUE IN NORMAL RABBITS.

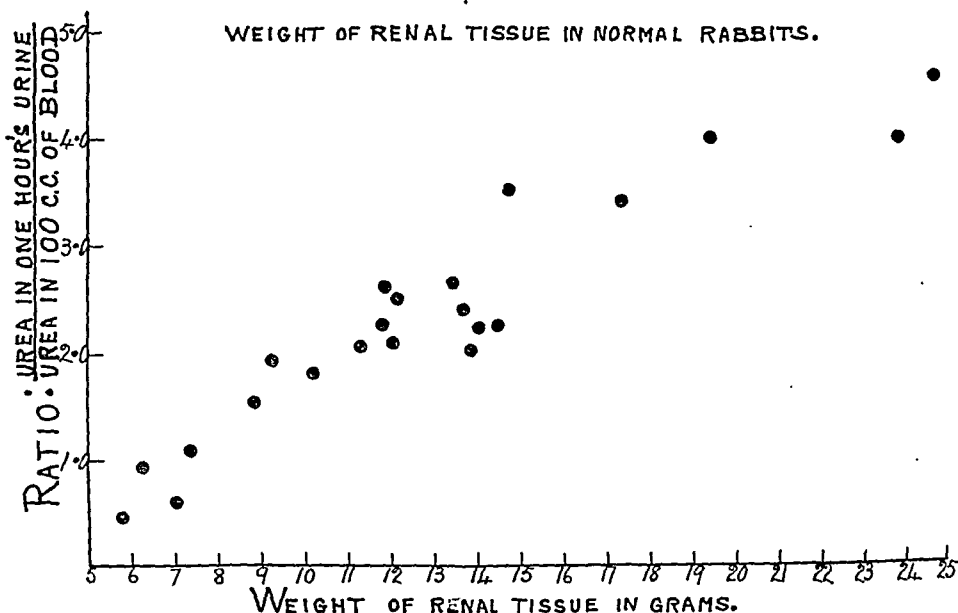


Chart II.

amount of effective renal tissue, provided that the conditions above specified have been fulfilled. Applying the test to 163 normal adult men, the average ratio was found to be 50.4 and this has been accepted as representing 100 per cent of normal kidney function.

As in normal individuals the usual 300 gram weight of kidney tissue varies more or less, so there exists a normal variation in the ratio test for function which has been noted in the series studied. In children, the ratio is always less than 100 per cent and with them there is a relation between the body weight and the ratio, just as there is between the renal weight and the body weight. More constant ratios would therefore probably be obtained in adults if the body weight

were introduced into the formula. In this study, however, correction for body weight has been made only in one of the subjects who was an exceptionally large woman, since in none of the other patients was there any marked variation in size and the validity of a correction based upon body weight alone is still uncertain. We believe the variability of the ratio in normal adults is largely due to the variations in the amount of kidney tissue they possess. This variation is of such an extent that in any single individual the ratio would have to fall below 75 per cent before we would be justified in supposing that the kidney was pathologically small. In a series of adult individuals, however, an average ratio appreciably less than 100 per cent would certainly be abnormal.

This paper deals with the ratio test applied to patients who developed hypertension, edema, and in some cases, convulsions, in the latter months of pregnancy and in whose urine evidence of a renal lesion was found in the form of albuminuria and casts. Because of the difficulties in obtaining accurately timed collections of urine and blood from patients who were too ill to leave their beds, we have been able to obtain accurate results from only a small number of patients, although the work has been in progress for more than a year and a half. In the acutely toxic patients we found that reliable results could be obtained only when the collections were made personally or under the close supervision of one or the other of the authors. In the less acute cases, the patients were brought to the laboratory where we ourselves could time the collections of blood and urine. All the results which we have thus obtained are given so that the chart represents a consecutive and unselected series.

The data obtained have been divided into three parts: first, ratios obtained on pregnant patients who were free from evidences of toxemia; second, ratios obtained from toxic patients before delivery; and third, ratios obtained from patients after delivery who had been toxic but whose hypertension, edema, and subjective symptoms had either disappeared or were in the process of disappearing.

Chart III shows the results obtained in normal pregnancy. It will be noted that the average result is 106 per cent, as compared with the average of 100 per cent obtained from 163 ratios on male adults whose kidneys were probably somewhat larger than those of women. This suggests that there may be some increase in the amount of effective kidney substance during pregnancy, although a larger series of cases would be necessary to prove this point. So far as our immediate problem is concerned, the figures show that the decrease found in toxic patients is a real decrease and not due to the pregnancy itself.

Chart IV shows the results obtained in toxic cases before delivery. In every case we succeeded in attaining a good diuresis with the ex-

CHART III  
NORMAL PREGNANCY—BEFORE DELIVERY

CASE NO.	RENAL CAPACITY	BLOOD PRESSURE		ALBUMIN GMS. PER 24 HRS.	TIME BEFORE DELIVERY DAYS
		SYSTOLIC	DIASTOLIC		
1	107%	134	76	Trace	82
2	93%	116	70	Trace	119
3	123%	122	68	None	61
4	103%	128	85	Trace	9
5	101%	110	72	None	82
6	102%	110	82	None	69
7	108%	140	92	Trace	52
8	93%	98	60	None	54
9	126%	103	65	None	75
10	95%	126	74	None	7
11	118%	126	86	None	5

CHART IV  
TOXIC—BEFORE DELIVERY

CASE NO.	RENAL CAPACITY	BLOOD PRESSURE		ALBUMIN GMS. PER 24 HRS.	TIME BEFORE DELIVERY DAYS
		SYSTOLIC	DIASTOLIC		
12	31%	155	115	15.3	7
13	66%	190		Much	15
13	74%	150	102	9.8	21
14	74%	180	105	0.1	30
15	76%	147	102	Much	1
16	88%	185	105	6.2	1
17	105%	156	98	1.0	20

ception of the first patient whose ratio might have been somewhat higher had larger volumes of urine been obtained. The amount of reduction in kidney function is variable and does not bear any close relation to the severity of the subjective symptoms. The most striking fact is that in these cases the reduction in the amount of effective tissue was not of such a degree as to be of serious and immediate clinical importance. The ratio would have to be reduced to 15 per cent or less of the normal before the renal condition could be regarded as in itself of immediate danger to the life of the patient. Though these observations are very few in number, there are data derived from other cases which support the idea that the conclusion we have drawn as to freedom from immediate danger of renal decompensation may have a general application. In our experience, a very marked reduction in effective renal tissue is always accompanied by the production of a pale, watery, dilute urine. In contradistinction to this, it is a well-known fact that in pre-eclamptic states or in eclampsia itself the urine is of a deep orange color. In such urine we have found high concentrations of urea. The color of the urine may, therefore, be taken as an indication of a retention of the capacity of the kidney to concentrate urea to a high degree, a circumstance which we believe is sufficient in itself to absolve the kidney from direct responsibility for the marked oliguria or even anuria which some-

times occurs. In these cases the cause of the failure to secrete urine is in the main extrarenal. There are apparently rare cases in which there is a widespread necrosis of the renal cortex,<sup>3</sup> but in the great majority the renal lesion is not of primary importance.

We believe the figures we have obtained justify us in emphasizing the point that the treatment of the toxemia of late pregnancy should be directed not to the relief of a supposed renal insufficiency, but to the removal of the cause of the toxemia. Therefore, if such measures as sweating and the giving of intravenous injections of alkaline solutions are indicated, it must be on the ground that they diminish the general toxemia and not that they are necessary because renal function is so depressed that the patient's life is on that account in danger.

In Chart V we have arranged observations made at varying intervals of time after delivery on patients who, during the latter months of their pregnancy, had suffered from severe toxemia.

CHART V  
PREVIOUSLY TOXIC—AFTER DELIVERY

CASE NO.	RENAL CAPACITY	BLOOD PRESSURE		ALBUMIN GMS. PER 24 HRS.	TIME AFTER DELIVERY DAYS
		SYSTOLIC	DIASTOLIC		
18	48%			0.5	40
12	49%			3.1	18
19	61%	170	108	>1.0	1460
20	62%	187	118	0.2	13
21	69%	120	75	<1.0	19
22	70%	125	95	>1.0	42
23	73%	108	86	<1.0	5
24	74%	150	78	4.6	8
13	81%	140		11.6	83
26	94%	138	90	<1.0	2
27	103%	144	88	None	114
28	107%	110	70	None	1885
17	122%	130	90	>1.0	613

The definitely lowered functional capacity found in eight of these twelve patients came as a surprise to us because, in consonance with the view which is generally held, we had expected to find a rapid and complete return to normal. It will probably occur, however, to most of the members of the Society that there may be an obvious explanation for this continued depression of function. Where it cannot be accounted for, as in Cases 22, 23 and 24, on the ground that the time for repair was too short, it will be assumed that we were dealing with patients in whom there was a pre-existent renal lesion, probably aggravated by the pregnancy toxemia, but in its origin independent of it, and therefore continuing its course after delivery. This is the assumption which is usually made when it is found that albuminuria continues for weeks, months, or years after all other evidences of toxemia have disappeared. But in the cases shown in this chart another explanation must be found. Our principal reason for this belief

is based upon work on the quantitative and qualitative characteristics of the urinary sediment in various types of renal lesion, which has been in progress for some years in the laboratory of the Medical Department.<sup>2</sup> The nature of the primary lesion in the kidney, the determination as to whether it is in the main inflammatory, degenerative, or atrophic; is indicated by the nature of the urinary sediment. Now in the cases we are discussing in which this lowered function was observed at considerable periods of time after delivery, the anatomical evidence obtained from the urine, that is, the number of casts and the percentage relationships between the various types of casts and other formed elements in the urine, indicated a continuation of the same lesion which starts *de novo* in uncomplicated pregnancy toxemia. When there is an active inflammatory lesion, the sediment is of an entirely different nature and contains blood casts which are never found in simple pregnancy nephrosis. Again, in any far advanced chronic renal lesion in which there is marked sclerosis, the broad, highly refractile, and dark granular casts indicate at once that the renal lesion is not that which is found either before or soon after delivery in pregnancy toxemia. In the cases cited in Chart V, neither these sedimentary findings nor previous urinary examinations, nor the past history, gave any support to the hypothesis of any renal lesion other than that which developed during the toxemia.

Ratios were obtained on six other patients who had passed through a pregnancy nephrosis. They are excluded from Chart V and are dealt with separately because in three of them there was evidence of a renal lesion independent of that produced in the toxemia, while in the three remaining cases the connection between the toxemia and the renal condition we found was not sufficiently established. Two were cases of glomerular nephritis, one diffuse and the other focal. One was a case of nephrosis of unknown origin not dissimilar from that which develops in eclamptic states, but almost certainly independent of it, since albuminuria had been found before pregnancy. A short summary of these three patients' histories is given at the end of the paper.

The other three cases warrant individual discussion because of the possibility that the advanced chronic renal lesion they all suffered from may have had its origin in an unhealed nephrosis contracted during a pregnancy toxemia.

In the case of Mrs. M., albumin was first found in the urine in the seventh month of her first pregnancy. She was delivered three weeks later. At that time the albumin concentration had increased so markedly that the urine boiled solid. The albuminuria did not clear up, and a few months later the edema which had been present before delivery returned. A year later an opportunity was given for a study of her case. There was marked generalized edema and enormous ascites. Large numbers of very broad, waxy, coarsely granular and refractile casts were found, a

picture typical of advanced renal sclerosis. The ratio was only 5.5 per cent. She died three months later.

In the case of Mrs. C., it is known that there was no albumin in the urine in 1914. It was found during her first pregnancy in 1915. Hypertension was also noted at that time. It is not known whether the albuminuria disappeared after delivery, but it was found again in 1917 and in 1919 in pregnancies which ended in abortion. She was first seen by us in the fourth month of her last pregnancy. The urinary sediment was that of renal sclerosis. The ratio was 2.8 per cent. The patient died after hysterectomy, and the kidneys were noted to be small and cystic at the time of operation. Unfortunately, no postmortem could be obtained.

The third case, that of Mrs. G., was first seen in January, 1921. There was marked hypertension. The urinary sediment contained many broad, waxy, coarsely granular and refractile casts. She stated that she had suffered from periodic severe headache since eclampsia in 1914. The ratio was 24 per cent of the normal. There was a progressive decrease in the ratio until her death in February, 1922. At the postmortem, the kidneys were found to be small and markedly sclerosed. There was no microscopical evidence of a former glomerular nephritis which might have led to a secondary contraction, but there was a pronounced arteriosclerosis of the renal vessels.

As a result of this preliminary study, the view we provisionally take is that the renal lesion in pregnancy toxemia is important not before, but after, delivery. The danger lies not in the extent of the lesion during the acute toxemia, but in the fact that it may fail to heal, and may become a continuing and self-perpetuating disease which either alone or with the help of a complicating arterial disease may ultimately lead to the death of the patient in uremia. We take this view only provisionally, because the number of our observations is small, and the whole question is an extraordinarily complicated and difficult one. It will require serial observations over a period of years on many post-toxic cases; much work on the effect on the kidney of normal pregnancy, both before and after delivery; and observations of the influence of pregnancy on patients with pre-existent renal lesions, before any certainty can be attained. At a later meeting of the Society we hope to bring forward further observations in the attempt to answer the questions we have raised.

#### CASE REPORTS

Cases 1 to 11 are normal pregnancies, histories not given.

##### *A. Toxic Cases, Before Delivery:*

CASE 12: June 6, 1921: Ratio 31 per cent. June 21, 1921: Ratio 49 per cent.

Age, twenty-two years, gravida ii, para 0. First pregnancy, 1920, aborted at six weeks. Second pregnancy, a year later. Entered the hospital with edema, headaches, blood pressure 186/124, and history of a convulsion 24 hours previously. Six months pregnant. On the day following there was 15.3 grams of albumin per 24 hours. The volume of urine after fluid restriction was 18 c.c. per hour (normal average 32 c.c.); when much water was taken the volume was only 54 c.c. per hour (normal average 643 c.c.). First ratio seven days before delivery. Because of the pronounced oliguria this ratio cannot be taken as representative of the total renal

capacity. Eight days after entering the hospital she was delivered by hysterectomy. Baby died because of immaturity. The albuminuria decreased after delivery but on the eighteenth day postpartum there were still 3.1 grams of albumin per 24 hours. The volume of urine was 327 c.c. per hour, sufficient to give a full ratio value, in the second ratio test.

Case 13: April 27, 1921: Ratio 74 per cent. May 3, 1921: Ratio 66 per cent. September 8, 1921: Ratio 81 per cent.

Age thirty-one years, gravida iii, para iii. First pregnancy ten years ago was terminated because of symptoms of toxemia. The albumin persisted for six months following this delivery, but at last entirely disappeared. In the second pregnancy, eight years ago, albumin again was noted in the urine, but again disappeared after delivery. In the twenty-fifth week of the third pregnancy, 1921, she was observed for 24 days during an increasing toxemia. Ratio test made on third day of toxemia. Urine contained 9.8 grams of albumin in 24 hours. On the eighth day second ratio test was made. The albuminuria increased until 23.7 grams of albumin were excreted in 24 hours. The sediment first showed only hyaline casts but epithelial casts in considerable number soon appeared. Hypertension rose to 235/140, accompanied with severe headache and vomiting. She was delivered by cesarean section. Fetus weighed 1 lb. 12 oz.; was alive at birth but died shortly after. The uterus was removed because of many fibroids. Following delivery the headache and vomiting disappeared, but the albuminuria and hypertension persisted, though in lessening degree. After twelve days 7.3 grams of albumin for 24 hours were excreted and the sediment showed many hyaline and a few waxy casts. The epithelial casts had disappeared. Third ratio test made 83 days after delivery. There were still many hyaline casts and 11.6 grams albumin in the 24 hours' urine. Still some hypertension.

CASE 14: September 24, 1921: Ratio 74 per cent.

Age, thirty-nine years, gravida i, para i. In the fifth month of first pregnancy albumin and hypertension appeared. In eighth month the urine contained 0.14 grams of albumin in the 24 hours' urine. There was a small number of hyaline, epithelial, granular and waxy casts, all of normal breadth. No toxic symptoms except hypertension. During the next month, hypertension increased until the systolic pressure was over 200. The albuminuria increased but there was never any large excretion. The largest amount was 0.5 grams for 24 hours. The number of casts, however, steadily increased. Labor was induced at the ninth month. Baby in good condition. Three months later there was no hypertension but the urine still contained a trace of albumin and some hyaline casts.

CASE 15: December 14, 1921: Ratio 76 per cent.

Age, twenty-six years. At eighth month of pregnancy the urine was found to contain a large amount of albumin. Systolic blood pressure 160. Until this time the blood pressure and the urine had been normal. Ratio test twelve days after onset of toxic symptoms. The water excretion was 13 c.c. on restricted fluids and 165 c.c. after increased fluids. There was marked edema present. There are no data as to whether or not albumin disappeared after delivery, which was induced on the day the test was made.

CASE 16: January 18, 1922: Ratio 88 per cent.

Age, thirty-three years, gravida i, para i. At eighth month had headache and edema. Albumin and casts appeared in the urine, followed by a rise in blood pressure. Delivered by cesarean section. Baby in good condition. Appendix removed; showed acute inflammation with pus in the lumen. The day before operation 6.2 grams of albumin was excreted in the 24 hours' urine; hyaline casts present. Ratio

test one day before delivery. With fluid restriction the hourly volume was 32 c.c. and after taking large amounts of water, 512 c.c. A week later there was only a trace of albumin in the urine.

CASE 17: Jan. 31, 1921. Ratio 122 per cent. Jan. 16, 1921: Ratio 105 per cent. Jan. 30, 1922: Ratio 96 per cent.

Age, thirty years, gravida ii, para ii. April 20 1919, first pregnancy. Noticed edema at seventh month. Family doctor noticed albumin for first time a few days before. Blood pressure, 109/120. Eye grounds were normal. Urine contained much albumin and many hyaline casts. Three days later patient had a convulsion; at this time the blood urea was 42 mgs. per 100 c.c. Patient was delivered by cesarean section. Twenty-one days after delivery, blood pressure was normal but there was still a heavy cloud of albumin and hyaline casts in the urine. First ratio test nine months after delivery. A catheterized specimen of urine contained a trace of albumin and a few hyaline casts. Water excretion was normal under restricted and forced fluids. Second ratio test when patient was seven months' pregnant. Has had edema for the past six months; no hypertension, but the pressure is now 160/100 and she has severe headaches. The urine has been free from albumin until this month. Albumin: 1.0 grams per 24 hours. Third ratio test 14 days later, when there was an increase in blood pressure. Urine contained 11 grams albumin for 24 hours; many hyaline casts. February 22, 1922, patient was delivered of a dead syphilitic baby. To this date there had been increasing hypertension and albuminuria. After delivery, hypertension decreased but it is not known whether the albuminuria disappeared or not.

### *B. Previously Toxic Cases, After Delivery:*

CASE 18: September 30, 1921: Ratio 48 per cent.

Age, twenty-five years, gravida i, para i. Had marked edema, moderate hypertension, and much albumin and many casts in the urine in the eighth month. Delivered by cesarean section three weeks later. Baby in good condition. Ratio taken 44 days after delivery. There was 0.5 grams of albumin per 24 hours and casts in the urine, but the blood pressure was normal. The water excretion was normal and there was no evidence in the sediment of glomerular nephritis.

CASE 19: February 19, 1921: Ratio 61 per cent.

Age, thirty-three years. In 1917 when three months pregnant, had edema headaches and albuminuria. At six months became suddenly blind. Two weeks later she was delivered by cesarean section. In 1921 the blood pressure was 170/108. No evidence of hemorrhages in the eyes. Some of the smaller arteries were tortuous. Ratio taken February, 1921. There was a trace of albumin, and hyaline and a few epithelial casts in the urine. With limitation of fluids there were 31 c.c. of urine excreted per hour; with increased fluids there was a maximum volume of 553 c.c. of urine.

CASE 20: February 3, 1921: Ratio 62 per cent.

Age, forty years, gravida iv, para iii. No knowledge of abnormality in first pregnancy. Following her second pregnancy she was blind for five days. Third pregnancy aborted. No evidence available as to the presence of albumin between the second and fourth pregnancies. In thirty-sixth week of fourth pregnancy she developed albuminuria and hypertension. Blood pressure, 270/150, accompanied with vomiting. She was delivered by Poro-cesarean section. Baby in good condition. Ratio test thirteen days after delivery. There was 0.2 gram of albumin in the 24 hours' urine. The volume of urine after fluid restriction was 15 c.c. and after large amounts of water, 585 c.c. The sediment showed only hyaline casts.



CASE 21: April 19, 1920: Ratio 69 per cent.

Age, twenty-seven years, gravida ii, para i. First pregnancy aborted at third month. In eighth month of second pregnancy had slight edema, blood pressure, 176/124, heavy cloud of albumin and hyaline casts in the urine, followed in two days by sudden blindness. Examination of the eye grounds showed nothing abnormal in the retina. Delivered by cesarean section. Baby in good condition. Ratio test nineteen days after delivery. Catheterized urine contained 0.03 grams per 100 c.c. and a few casts. With increased fluids the volume of urine was 532 c.c.

CASE 22: September 16, 1921: Ratio 73 per cent.

Age, seventeen years, gravida ii, para i. Until the thirty-first week there was no hypertension, no edema, and only a trace of albumin was found in the urine. She was delivered ten days before term. On the following day she had two convulsions and there was a light cloud of albumin and a few hyaline casts in the urine. Ratio taken five days after delivery. Maximum volume of urine after increased fluids were given was 583 c.c. per hour. She is now (April, 1922) pregnant for the second time. Blood pressure 136/95 with no signs of toxemia. Labor due October 3, 1922.

CASE 23: August 17, 1920: Ratio 74 per cent.

Age, twenty-four years, gravida i, para i. Urine was normal to seventh month of first pregnancy; blood pressure 125/70. Three weeks later some generalized edema. Blood pressure 160/110. During the next 28 days the systolic blood pressure did not rise above 170 but there was an increasing amount of albumin in the urine and many hyaline casts. Then spontaneous labor occurred. Child was still-born. After delivery the blood pressure did not show any appreciable decrease until after the tenth day and the urine showed a light cloud of albumin, forty-three days later. Ratio taken eight days after delivery. There were 4.6 grams of albumin in 24 hours' urine and many hyaline casts were present.

CASE 24: November 11, 1920: Ratio 94 per cent.

Age, twenty-six years, gravida ii, para ii. Headache, vomiting, edema, hypertension at thirty-ninth week of pregnancy. Spontaneous delivery. Baby in good condition. The ratio was taken two days after delivery.

CASE 25: February 25, 1922: Ratio 103 per cent.

Age, twenty-six years, gravida i, para i. At the thirty-fourth week of pregnancy had edema, with severe headaches, terminating in four convulsions before delivery. Urine contained no albumin to the onset of convulsions. Delivered by cesarean section. Baby in good condition. The day after delivery, there was a heavy cloud of albumin in the urine. The following day there were epithelial casts 4 per cent, granular casts 6 per cent, hyaline casts 90 per cent. Twenty-eight days after labor the urine contained no albumin. Ratio taken 114 days after delivery. The maximum volume per hour was 587 c.c.; with restricted fluids there were 28 c.c. excreted per hour. No albumin and no casts.

CASE 26: January 11, 1922: Ratio 107 per cent.

Age, twenty-four years, gravida vi, para i. In first pregnancy, 1917, labor was induced at eighth month because of albumin and high blood pressure. She was curetted in the second, third, fourth, and fifth pregnancies because of the fear of toxemia. Nov. 21, 1921 she entered her sixth pregnancy. The urine examinations have been negative since the first pregnancy. Ratio test Jan. 11, 1922. After abstention from fluids, two hyaline casts were found; no albumin. The volume of urine per hour was 14 c.c. After taking large amounts of water the volume of urine was 432 c.c. Blood pressure, 120/82. She is now five months pregnant with no signs of toxemia.

*C. Cases with Renal Lesions Differing from the Type of Lesion Found in Pregnancy Nephrosis or Originating Apart from Any Pregnancy Toxemia:*

Mrs. B., age forty years, gravida iv, para ii. The patient was seen in the seventh month of pregnancy. No albumin or casts were found on a routine urinary examination. The blood pressure was 123/74. A cesarean section was done soon after admission on account of malposition of the uterus, due to a ventral fixation operation. On the day following operation, bronchitis was found which in a few days developed into a definite bronchopneumonia. In a few weeks the signs in the lungs had disappeared, but an infected pelvic hematoma was found. At about this time a urinary examination showed a heavy cloud of albumin and the sediment contained many blood casts and other evidences of an active glomerular nephritis. The lesion was diffuse and progressive, for the blood urea concentration began to rise, the ratio fell below 1, and the patient died in uremia a month after the operation. The microscopical examination of the kidneys showed a diffuse subacute glomerular nephritis.

Mrs. M., age thirty-six years, gravida iii, para ii. She was first pregnant in 1914, but aborted. It is not known whether there was any albuminuria at that time. In 1915 during her second pregnancy albumin was found at the first examination during the sixth month. Edema and headaches developed later and labor was induced two weeks before term. In 1921 she again became pregnant and a month before term labor was induced on account of headaches, edema, hypertension and albuminuria. She was first seen by us six weeks after the termination of this third pregnancy. There was a slight albuminuria (0.48 grams in 24 hours) and at the first examination only hyaline casts were found. The ratio was 70 per cent of the normal, the water excretion was normal and there was no hypertension. Four months later another concentrated twelve hours' urine was obtained by catheter, and on this occasion a simple blood cast was found. This is of course in itself an insufficient ground on which to make a diagnosis of glomerular nephritis, but it is enough to raise the question as to the possibility of a focal inflammatory lesion in the kidney.

Mrs. B., age twenty-two years, gravida, iii, para 0. Six years before there had been occasional swelling of the ankles, and a doctor had told her there was something wrong with the urine. No special treatment was advised, and as the edema disappeared and her health was good, no further urinary examinations were made until two years ago when she consulted a doctor for some temporary ailment. At that time albumin was found in the urine, but the amount is not known. It was enough, however, to lead her physician to advise restriction of protein and salt. Six months later, in 1920, she became pregnant, and at the third month developed hypertension, and edema. Albumin was again found. On this account the pregnancy was terminated. In January and June of 1921 therapeutic abortions were done about the end of the third month because of hypertension, edema, and albuminuria. She was seen in July, 1921, a month after the last abortion. The urine contained 0.23 grams of albumin in 24 hours. The sediment contained hyaline, waxy and epithelial casts in small numbers. The blood pressure was 142/60. Water excretion was normal. The ratio was 74 per cent.

#### REFERENCES

- (1) *Addis*: Arch. Int. Med., 1922, (in press). Jour. Urol., 1917, i, 263. (2) *Ibid.* Cal. State Jour. Med., March, 1922. (3) *Jardine and Kennedy*: Lancet, London, 1920, ii, 116.  
(For discussion, see p. 418.)

## RETROVERSIONS OF THE UTERUS FOLLOWING DELIVERY\*

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I BELIEVE it of interest to present to you a follow-up study that may add somewhat to the scanty data concerning the frequency and meaning of the uterine retrodisplacements that develop after childbirth. It is based on the pelvic condition of 1230 women who were delivered at term in our wards and who were examined thereafter at intervals for a minimum of four months and a maximum of twelve months. There were no known pelvic inflammations in the series. During the period of this investigation, 2037 women were delivered at term in our service. The study, therefore, is based on 60.3 per cent of the total material that was delivered at term.

The fact that we were able to follow but 60 per cent of our obstetric material deserves some consideration, since in another study<sup>1</sup> we followed 90 per cent of 458 operative cases for periods between one and four years. Various factors have been combined to prevent the follow-up of more of the obstetric cases. Thus, nearly 15 per cent of the cases were known to be illegitimate and disappeared immediately after labor. Eight per cent lived out of town and too far away to permit of subsequent returns. A smaller percentage were "chronic poor" who move often and cannot be traced. Nearly 10 per cent, however, could not be induced to return nor persuaded that their pelvic condition following delivery might be a matter for their subsequent concern.

We term as retrodisplacements in this study any retroversion or retroflexion of the second or third degree.

We have tabulated the cases in various manners in an attempt to find (1), the frequency of retrodisplacements in the year following delivery.

(2), the possible influence of vaginal relaxations, forceps extractions, and parity upon the production of the displacement.

(3), the months when the retrodisplacements were first noted.

(4), the percentage of retrodisplacement cases that developed symptoms.

(5), the month when symptoms first developed.

(6), the result of pessary treatment.

(7), the comparative frequency of subsequent pregnancy in women with retroverted and anteфлекed uteri.

(8), the anatomic result of operations for retrodisplacements.

1. *The frequency of retrodisplacement of the uterus during the year*

\*Read at the Forty-seventh Annual Meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

*following delivery.* There is some literature bearing upon the frequency of retropositions. A number of observers have determined that about 22 per cent of gynecologic cases have retroverted uteri. A few have sought to determine its frequency in women in general. E. Schroeder's report<sup>2</sup> is the best known of these. He found retropositions in 28.7 per cent of 411 women taken from the Königsberg gynecologic dispensary, the obstetric and medical clinics. A few only have investigated the frequency of posterior uterine displacements following delivery. Winter<sup>3</sup> found that they occurred in 12 per cent of 300 women from two to ten months after labor. In marked contrast, we found posterior displacements at some time during the first year following confinement in 41.1 per cent (505 cases) of the 1230 in the series. It seems worthy of comment that retrodisplacements existed in only 19.6 per cent of the 186 private cases which were studied in the series. This small percentage held down the figure for the total series since the frequency in the clinic cases was 44.8 per cent. Since our clinic patients almost without exception were hard working women, and the private patients were of the leisure class, it seemed safe to assume that hard work following delivery increases the frequency of retroversions and retroflexions.

2. *The comparative frequency of vaginal relaxations and forceps deliveries in the retrodisplacement cases and the normal controls, and the influence of parity in the production of the uterine displacements.* The series presented 505 cases with retroverted uteri and 725 normal controls. Vaginal relaxations sufficiently marked to warrant repair appear to have little influence on the production of the displacements since they were found in only 29 per cent of 505 retrodisplacement cases in contrast with 24 per cent of the 725 cases used for control. We then grouped together all the cases with vaginal relaxations and divided them into two classes, accordingly as the uterus was retrodisplaced or in the normal position. There was extremely little difference between the percentages of the two groups. The cases of relaxed vaginal outlets with retroposed uteri constituted only 46 per cent of the total in contrast to the relaxed vaginal outlets with normal uterine positions which comprised 54 per cent of this series.

We have reviewed the forceps series hoping to determine to what extent lacerations from instrumental deliveries were responsible for the displacements. Nine and six-tenths per cent of the 1230 cases were delivered at some time by forceps. Forceps were used in the labors of 10.3 per cent of the 505 retroposition cases and in 9 per cent of the 725 normal controls. In a preliminary study based on a total series of 761 cases, the percentages were 9 per cent and 5.7 per cent respectively. There were very few high forceps and comparatively few midforceps. An unusual number of low forceps for uterine inertia

brought up the percentage. Yet it does not seem as if forceps could have been of much etiologic moment since there were only 119 applications in the 1230 cases and there were 505 retroflexions for which we seek the etiology.

We attempted to ascertain whether a larger proportion of the retrodisplacements had had difficult first labors but abandoned the study because of difficulties in making comparison.

Grouping our cases as the uterus was forward or back, we arranged them according to the number of children they had borne. Our suspicion that a woman was more likely to develop retrodisplacement after many labors than with a few does not seem to be borne out in Table I. The most striking point developed from the compilation was that there were more women who had extremely large families in the normal group than in the retrodisplacement cases. Thus, there were 20 women in the 725 normal controls who had had from nine to fourteen children, in spite of which the uterus remained upright during a minimum observation of six months following labor. On the contrary, there were only two of the 505 retrodisplacement cases who had had as many as nine children.

TABLE I  
PARITY AND DISPLACEMENT

UTERUS RETROPOSED 505 CASES		UTERUS NORMAL 725 CASES
	per cent	per cent
Para I	43.9	44
Para I and II	65.6	63.4
Para I-III incl.	78.2	76.7
Para I-IV incl.	87.5	83.2
Para I-V incl.	93.2	90.1
Para I-VI incl.	96.9	94.7
Para I-IX incl.	100	100

3. *Month when the uterus was found displaced.* (Series of 505 cases.)—Our postpartum cases are urged to return for observation six weeks, three months, six, nine and twelve months after delivery. Not all reported absolutely on this schedule, although the majority did so. When they did not return during the week they were due, they were summoned by another letter, and if this failed, a nurse was sent to bring

TABLE II  
MONTHS FOLLOWING DELIVERY WHEN DISPLACEMENT WAS NOTED

505 CASES	
First Month	28 per cent
Second Month	26.5 per cent
Third Month	12.5 per cent
Fourth Month	9 per cent
Fifth to Eighth Month	18 per cent
Eighth to Twelfth Month	6 per cent

them in. This delay made many visits later than schedule. Seventy-six per cent of the 505 cases were found to have uterine displacements within four months after delivery; 18 per cent developed displacements during the second four months; and 6 per cent during the last four months of the year.

4. *The percentage of symptoms in retropositions and in the normal control cases.* (Series of 1230 cases).—Great interest centers about the frequency of pelvic symptoms in the retroposition cases in comparison with those in the controls. This phase of the subject has been considered by several investigators. Winter's series of 300 cases presented 36 cases which had displacements two to ten months following labor. Eleven of these had no pelvic symptoms. Of the 25 remaining cases of the series, Winter concluded that only four had symptoms which were due to the displacement. Seeking to determine the relation between uterine displacements and symptoms, he examined 710 women who appeared normal. Twenty-two per cent (154 cases) had posterior displacements, 60 per cent of which gave no pelvic symptoms. E. Schroeder subsequently continued this investigation. His material comprised 411 cases, 82 of which were from the gynecologic polyclinic, 84 from the obstetric and 145 from the medical clinic. Posterior displacements were found in 28.7 per cent of this number. Schroeder states that 73 per cent (303 cases) of the total had no pelvic symptoms, yet 26 per cent (79 cases) of these had retroversions. There were 108 women who complained of lower abdominal symptoms, 36 per cent (39 cases) of which had displacements. Schroeder, therefore, concluded that 25 per cent of women who complain of no symptoms referable to their pelvis have retroversion. This investigation is the basis of the school which believes that uterine displacements are usually of little importance.

In our study we have classed bearing-down sensations, or a feeling of pressure in the pelvis, or sacral backache as pelvic symptoms. While agreeing with the view which holds that these symptoms may well develop from pathology associated with the uterine displacements rather than from the retroposition itself, we submit that it is of interest that they were three times as frequent in the retroposition cases as in the normal controls in our series. Thirty-two per cent of the 505 retroversions came in because of symptoms, as did ten and a half per cent of the 725 normal controls. The remainder of the two groups were brought back purely because of the urgency of the follow-up. Our study forces the belief that nearly all of the differences between these two percentages is due to the sequelae of retroposition, as it is likely that faulty posture and bad feet are equally common in both the major groupings of our study. Vaginal relaxations were present in approximately the same percentage in each series, 29 per cent of 505

retroversions (146 cases), and 24 per cent of the 725 normal controls (174 cases). We also attempted to see to what extent the symptoms depended upon vaginal relaxations. There were 162 of the 505 retroposition cases who came in because of symptoms. In this series of 505 cases, there were 146 vaginal relaxations. There were 76 of the 725 normal controls who came in because of symptoms. Yet there were 174 vaginal relaxations in the 725 normal controls.

5. *The month in which symptoms developed.*—This section throws much sidelight on the previous grouping. There were 161 of the retroposition group that complained of pelvic symptoms. Arranging our cases to show the time of the appearance of symptoms, we found pelvic symptoms developed in 50 per cent of the 161 cases in the first three months; 25 per cent in the second quarter; 15 per cent in the third; and 10 per cent in the fourth quarter.

TABLE III

## 161 CASES RETRODISPLACEMENT PRESENTING SYMPTOMS

MONTH APPEARANCE OF SYMPTOMS	
I	20 per cent
II	20 per cent
III	10—50 per cent
IV to VII	25 per cent
VII to X	15 per cent
X to XII incl.	10 per cent

6. *Pessary treatment.*—We attempted to correct the displacement in all cases. The great majority were straightened without anesthesia. All subinvolution cases were treated with douches and tampons. The entire series were advised to use the knee-chest position and the kangaroo walk. No attempt was made to manually correct the displacement until at least five weeks had elapsed after delivery. The position was corrected then and pessaries were placed in 281 cases, all of which were subsequently followed. The position was not corrected in the remainder of the series, either because the uterus could not be brought forward without gas anesthesia, for which the patient failed to return, or because the vagina was too relaxed to hold a pessary. Pessaries did not hold in 47 of the 281 cases. The patient refused to wear them in 32 instances. Orthopedic cures were obtained in the remainder (72 per cent) so that the uterus remained forward after the removal of the pessary. Operation was advised in the 47 cases that the pessary did not hold. Twenty-one of these subsequently came to the various repair operations.

There were 161 cases of retroversion which presented symptoms sometime during the first year after labor (32 per cent of the 505 retroversions). Sufficient time has not elapsed to permit final judgment as to the result in 14 cases. The symptoms disappeared following the

correction of the deformity by pessary in 68 per cent of the remaining 147 cases and this has continued following removal of the support. The symptomatic cure by pessary treatment, therefore, is 68 per cent. Partial symptomatic cure was obtained in 15 per cent. This treatment failed in 17 per cent and operation was advised in this group.

7. *Relative fecundity*.—It is extremely difficult to draw conclusions from a statistical study as to the relative fecundity of the various groups of a series unless the tables contain many thousands of cases. Hoping to reduce error, we have studied only the 761 married women who formed an earlier series, and who have been observed for a minimum of two years. Pregnancies were observed in 15 per cent (65 cases) of 430 women who did not have displacements. There were only 10 per cent (32 cases) of pregnancies in women who had had posterior uterine positions but who had been treated by correction of the displacement and pessary support. Six women whose uterine displacements had not been satisfactorily corrected returned pregnant. There were only 119 cases in this group, giving an incidence of pregnancy of 5 per cent. One case came back with an early pregnant uterus prolapsed over the pessary and two others had early pregnancy in a retroverted uterus, although that organ had been up in place when the patient was last seen.

8. *Anatomical result of operation*.—During the period of this investigation, we have performed 191 uterine suspensions in women whose symptoms were of several years' duration with the exception of the few cases considered in the above study. All of the cases were so-called simple suspensions, that is, no case presented definite inflammatory disease, although there were many cases with mildly diseased ovaries. The majority needed vaginal repairs which was done when necessary. The appendix was removed in nearly all cases. We have thought it worth while to report the subsequent anatomic studies of the pelvic condition. There were no deaths in the series. Two of the cases were lost for the purpose of study. The remainder were followed for a minimum of six months and a maximum of three years. A study of this type seems advisable since more than 130 retrodisplacement operations have been described which are all advocated as the very best procedure.

One hundred and eight Webster operations were performed with two recurrences. The return in one was found four months after operation. She became pregnant one year after discharge from the hospital. The recurrence was not complete in the other case, although the uterus sags unless she wears a pessary. Thirty-one Coffey operations were performed without recurrence. The twenty-eight Kelly-Neel operations were followed by four recurrences, three of which were subsequently operated, and one was treated by pessary. Atypical Ferguson operations were done in five cases, as were sixteen atypical operations in which a new fundal insertion was made of the round ligament. There



was no recurrence in this group. The subjective results for the series will appear in another paper.

Six recurrences in a series of 189 cases (3.3 per cent) seems very high when broad serous surfaces were approximated and were held together by nonabsorbable sutures in all cases. The three recurrences in the Kelly-Neel group which were subsequently reoperated gave constant anatomic findings. Careful notes of the pelvic condition had been made at time of operation in each of the 191 cases.

As a result of our study, we feel that we may adduce conclusions to account for the failures.

The round ligament operations now performed fall in three great classes, viz., (1), those which shorten and refix the round ligament in the inguinal canal, including the Alexander procedure and its modifications; (2), those which elevate the uterus by a new fixation of the round ligament in the abdominal wall, as the Olshausen and the Gilliam suspensions and their modifications; (3), those in which a new attachment of the ligament is made on the fundus of the uterus, as in the Coffey, Webster, and the atypical operations of our series.

The round ligament was not designed by Nature to hold the uterus forward, except possibly in pregnancy. Yet it may be made to do so when it is shortened sufficiently, provided the insertion in the inguinal canal is firm and the uterine origin is in its normal elevated position. While interested in this subject, we have been surprised to find how frequent are abnormal attachments of this ligament. Thus, the uterine insertion of the round ligament often loses its high fundal attachment and slips down in long standing retroversions even as far as the peritoneal reflection of the bladder. In such cases, the uterine end of the ligament may be spread out like the blades of a fan (Fig. 1). Traction on the distal end of such a round ligament will not pull the fundus over in flexion, because the ligament is really attached to the midpoint of the entire organ, i. e., uterus and cervix taken as a whole. Such a pull is far more likely to bring the uterus forward in the old retroposed position with the cervix anterior to the level of the fundus and pulled up close to the symphysis. We have also been impressed by the number of lax inguinal rings in which there are weak and yielding attachments of the round ligament. It naturally follows if the fixation point in the groin is not firm, that any round ligament operation of groups one and three will fail.

Our experience has shown that the uterosacral operation as usually performed through the abdomen merely shortens the peritoneal fold and does not reach the strong part of the ligament. The strong part of the uterosacral as seen from an incision in the abdomen is close to the uterus. The superficial part of the ligament has no firm fixation on the sacral side and if put on a stretch will show a pull scattered out

on the peritoneum even as far as the mesentery. Few abdominal operations utilize the deeper portion of the ligament since hemorrhage is likely to occur during the procedure. We have opened seven cases in which others had performed unsuccessfully the ordinary abdominal shorten-



Fig. 1.—Showing atrophy of uterine end of round ligament and that forward traction no longer elevates the fundus.

ing of the uterosacrals. Three were the recurrences in the Kelly-Neel operation in this series. In each case, the nonabsorbable sutures were found high up on the cervix and shrouded in filmy adhesions. There was no vestige of a new ligament.

There is no doubt that the two recurrences which followed the 108 Webster operations resulted because the weakened attachment of the ligament in the inguinal ring was not properly appreciated in the examination during the operation. At any rate, this attachment was not strengthened at the time by suturing. If the fixations of the ligament are firm, even a weak round ligament will maintain the position. The good results which have been obtained by Kelly suspensions show that very little restraining force is necessary to keep the uterus forward if that organ is in the forward position. It would appear, on the contrary, that the four recurrences in the 28 Kelly-Neel operations resulted because the fundal insertion of the round ligament had slid down from its previously high origin and for that reason, the operation had not been well chosen. The cases were all done by one operator, who also shortened the uterosacrals in the routine of the operation.

It follows, therefore, that the surgeon should carefully consider both the groin and uterine attachments of the round ligament before determining upon the type of his operation. He may find it necessary to advance the uterine origin as well as to strengthen the insertion in the canal, a procedure which we have taught for several years.

The behavior of the ovaries following the various suspensions has been a matter of some concern. Ovaries in long standing retroflexions commonly develop symptoms. Many men, forgetting this point state that ovaries are more apt to give trouble after certain types of operation. Our records show that one or both ovaries were enlarged and tender in 11 of the 108 Webster operations; in five of the 28 Coffey; in eight of the 27 Kelly-Neel; and in four of the 20 Ferguson and atypical cases. None required subsequent operation.

We cannot properly discuss the question of pregnancy following operations since only 15 women in the 189 have yet become pregnant. Their pregnancies total 19. Two women were aborted because they became pregnant immediately following operation. They have since borne children. There was one pregnancy in the Coffey group, eleven in the Webster, and four in the Kelly-Neel, one of which miscarried. Two women in the Webster group have had two children each, since operation. There were no dystocias in the series and there has been no recurrence of the displacement.

The grossly apparent errors of the work are that we have not followed 100 per cent of the cases, nor observed all of the series for an equal length of time; moreover, we are ignorant of the pelvic condition prior to the first pregnancy. Yet we believe that we may reasonably present the following conclusions:

1. Retrodisplacements were noted in 41.1 per cent of 1230 cases which were accurately followed between four and twelve months after delivery.
2. Thirty-two per cent of the 505 retropositions came back because

of pelvic symptoms. Ten and a half per cent of 725 controls with upright uteri complained of slight symptoms.

3. Nineteen and six-tenths per cent of 186 private cases presented retropositions in contrast to 44.8 per cent found in 1044 clinic cases. Hard work may, therefore, be an important etiologic factor in retrodisplacements.

4. Replacement of the uterus and pessary support gave anatomic correction in 72 per cent of the cases which wore pessaries. Symptomatic cure and anatomic correction were obtained by identical procedures in 68 per cent of the 161 cases presenting symptoms.

5. Subsequent pregnancies were observed in 15 per cent of a portion of the series in women who did not have displacements, in 10 per cent of women who had treated retropositions, and in five per cent of cases whose retroposition had not been corrected.

6. No one type of suspension has been entirely successful in our hands. There were two recurrences in 155 operations which made a new round ligament fixation upon the uterine fundus necessary (108 Webster, 31 Coffey, 16 atypical). There were four recurrences following 28 Kelly-Neel suspensions, together with the shortening of the upper part of the uterosacral ligaments.

7. The need of early correction of retropositions following labor is clearly evident.

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(For discussion, see p. 421.)

# CLINICAL AND EMBRYOLOGIC REPORT OF AN EXTREMELY EARLY TUBAL PREGNANCY; TOGETHER WITH A STUDY OF DECIDUAL REACTION, INTRA- UTERINE AND ECTOPIC

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*(Continued from September issue, p. 227.)*

## II

### A STUDY OF DECIDUAL REACTION, INTRAUTERINE AND ECTOPIC

PROMPTLY following the fertilization of the ovum there develops in the maternal body a peculiar phenomenon which has been termed the "decidual reaction." With the rapid progress that is being made in the sum of knowledge concerning human placentation and the orientation of the ovum the views on the formation of the decidua have undergone a notable change. We know now that while this reaction is designed to be preeminently an intrauterine phenomenon, it is by no means limited to this region, even in normal gestation. In order to perfect the study of the interesting case of early tubal pregnancy which is here recorded, I have carefully compiled and classified the various published contributions on the decidual phenomena of pregnancy, and here present a systematic résumé of the facts and theories pertaining to normal and ectopic decidual reaction as recognized today.

#### THE EARLY ENDOMETRIAL CHANGES OF NORMAL PREGNANCY

Fertilization occurs at the favorite resting-place of the spermatozoa—the upper, outer portion of the fallopian tube. Although it is probable that the decidual reaction begins in the uterus imperceptibly shortly after conception and long before the appearance of placental tissue, it is not until about the third week that the changes become distinct. They are then most marked at the site of ovular attachment, although occurring to a varying degree in the entire uterine mucosa. Taussig remarks that, independent of the location of the pregnancy, the uterus is the seat of the most extensive decidua formation, the tissue appearing as a definite layer as distinguished from the discrete patches of decidua elsewhere in the body.

There are five distinctive features of the new-formed tissue, as Johnstone has indicated, namely, "a transformation of the embryonic connective-tissue corpuscles of the stroma into the large decidual

cells''; an increase in the number of the glands and a greater tortuosity in their course; a marked thickening of the endometrium, which becomes corrugated superficially; a varying degree of edema of the stroma; and a congestion of the blood vessels. The structure thus produced is termed the *decidua*. It presents two clearly defined layers—an upper compact surface (*stratum compactum*), in which are found the decidual cells and the ducts of the glands; and a lower spongy layer (*stratum spongiosum*), containing only a few decidual cells, the blood vessels and the dilated glands forming cavities. The differentiation of the decidual layers is due to this glandular hyperplasia. The point of pronounced decidual reaction immediately beneath the implanted ovum is termed the "basal decidua" (*decidua basalis*), and that portion which pouts up and surrounds or even covers the ovum, the "capsular decidua" (*decidua capsularis*, of His) or *decidua reflexa*. The remainder of the structure covering the entire uterine cavity is the "true decidua" (*decidua vera*).

It is now generally conceded that the intrauterine decidual reaction commences, or, at least, becomes evident, when the ovum begins to invade the endometrium. Its rapidity of development varies greatly according to the peculiarities of the individual. As yet it has not been determined whether the reaction precedes or follows the ovular implantation. It is known, however, that the younger the ovum the less pronounced is the reaction. Thus, such ova as Jung's and Peters' show practically no decidual formation other than a few cells which closely surround the ovum. Also, most of the well-known early ova do not show the two decidual layers save indistinctly; in the Heine-Hofbauer ovum they are entirely absent.

*The Decidual Cell.*—The main characteristic feature of the decidual reaction is the appearance of a peculiar cell which has its origin in the loose connective tissue of the uterine mucosa. In size this cell greatly exceeds that of the cell of the interglandular substance of the mucosa, and in shape it is very irregular. When fully developed it closely resembles the epithelioid cell of tuberculosis, the lutein cell of the yellow body of the ovary, and the large round cell of sarcoma. Because of this varied resemblance to normal and pathologic cells it has been termed by Ruge "the physiologic type of this pathologic [sarcomatous] unit."

The decidual cells are large, beautifully clear, with a delicate protoplasm containing round nuclei which stain deeply (*Pfannenstiel*); they vary in shape, being round, oval, polygonal or spindle-like (*Taussig*); and in size they range from 20 to 50 microns in diameter. In the compacta they are closely grouped and interspersed with smaller cells of a polygonal shape, which Marchand regards as the decidual cells in the earliest stage of development. In the spongiosa they are more widely separated, lymph-channels together with a few

leucocytes lying between them. Fibrillar prolongations connect the decidual cells in this region, the prolongations passing through the intercellular substance.

Hirschberg mentions as the most striking characteristics of the decidual cell: Its unusual size; its variation in shape; and the peculiar staining properties of its protoplasm. It is never found save in pregnancy; and it first develops around the arterial capillaries of the endometrium, which would seem to indicate that the stimulation to the decidual reaction is borne by the blood-current.

*The Decidual Stroma.*—A decided passive or venous hyperemia of the endometrium, which has been particularly noted by Jung (1908), is characteristic of the entire decidua. All the blood vessels are in a stage of congestion, and this, doubtless, is the explanation of the edematous condition of the decidual stroma which has been marked in all early ova.

*The Endometrial Glands.*—Some histologists regard the presence of papillary epithelial projections into the lumina of the glands as a characteristic feature of the early decidua. Johnstone, while speaking of the endometrial glands, remarks that "Bryce and Teacher suggest that the glands are more resistant to the destructive action of the trophoderm than the other tissues, although they ultimately suffer some dissolution. Frassi (1907) has shown conclusively that the glands may be opened into laterally, and it is probable that this may be effected either by the eroding action of the trophodermic buds, or by the digestive action of the proteolytic ferments of the trophoderm while that tissue is at some little distance. This is presumably the explanation of three observed facts—firstly, the presence of epithelial 'rests' in the 'border zone,' formerly, but probably erroneously regarded as relics of the superficial epithelium; secondly, the opening of glands into the intervillous spaces, observed by Frassi (1907) and Fetzer (1910)—the glands as they run up towards the equatorial portion of the decidua capsularis being opened into laterally; and thirdly, as a consequence of this, the presence of blood in the gland-spaces, which has been noted by Siegenbeek van Heukelom (1898), Leopold (1906) and Fetzer amongst others."

*Cervical Decidua.*—Generally the decidual reaction is confined to the corporeal endometrium, ending at or above the internal os. It has, however, occasionally been noted, in the form of irregular patches of decidual cells, in the cervical mucosa, such cases having been recorded by Carl Fisch, Hohmeier (1905), Waldstein (1900), Blumberg (1905), von Franqué (1897) and Volk (1903), notwithstanding Gebhart's assertion that a true cervical decidua is never found.

Most of the cases of cervical decidua have been noted in association with the various forms of placenta prævia or with a low lateral implantation of the placenta in the upper part of the lower uterine seg-

ment. In the cases of central or complete placenta prævia, such as are recorded by Ponfick (1899), Weiss, and Keilmann (1897), the cervical decidua was very marked. Some authorities, notably Blumberg, believe that a cervical decidua is always present in placenta prævia and should be regarded as a diagnostic feature of this obstetric accident. The association of a cervical decidua with a low placental site is the strongest argument that can be adduced in support of Pozzi and Caseaux's theory that "the intensity of decidual reaction in the uterus is dependent on the proximity of the ovum." This theory fails, however, in the light of the more recent knowledge of the subject. Muscular hypertrophy only, as Taussig has indicated, bears a direct relationship to ovular proximity.

#### THE CAUSATION OF THE DECIDUAL REACTION

A natural inquiry arises as to the cause of this curious change in the uterine mucosa during early gestation. Biologists have accepted two theories as plausible; they have, moreover, come to the conclusion that these etiologic factors are cooperative, although which is the more potent is not as yet determined. The theories are as follows:

a. *The Chemical or Hormone Theory of Loeb.*—This implies some obscure biochemical influence originating after the fertilization of the ovum, and springing either from the ovum itself or, more probably, from the corpus luteum of the ovary.

In 1898, the yellow body of the ovary was recognized by Prennant as a very important member of the group of so-called ductless glands, playing, as O'Donoghue (1911) states, "a part in the chemical coordination of the body." It is more than a mere scar. It has a distinct glandular structure, and its characteristic lutein-cells are those of a typical secretory gland, being epithelioid both in their origin and nature. The body appears within a few days after fertilization; steadily develops in size and activity through the first half of gestation; and then, having accomplished its purpose, gradually fades away to become the white fibrous scar known as the *corpus albicans* which, through leucocytic phagocytosis is eventually absorbed. Like the other ductless glands it possesses a very rich blood-supply which especially reaches the active lutein-cells, whose lipoid secretion thereby directly enters the blood-current. This vascularity of the corpus luteum persists even to full term, and the organ during the first half of pregnancy shows abundant evidences of colloid (*Bartelmez*).

*The Functions of the Corpus Luteum.*—It is now definitely known that these functions are at least three in number:—*Primarily*, the corpus luteum plays a most important rôle in the process of ovular implantation and early embryonic development; *secondarily*, it stimulates mammary development; or, as O'Donoghue remarks, while "no



definite evidence has been adduced to show that the corpora lutea produce a specific secretion which when poured into the blood-stream directly influences the mammary glands, the presumptive evidence is strongly in favor of such a direct chemical stimulus;" this inter-relationship is proved by the associated growth of the mammaræ at puberty (when ovulation is established), in menstruation and pregnancy, and in the presence of certain ovarian tumors; also by the associated mammary atrophy at the time of the disappearance of the corpus luteum and in connection with the destruction or removal of the ovarian tissues; *thirdly*, as Beard indicated in 1897, the corpora lutea retard ovulation during pregnancy to a limited extent.

To Gustav Born belongs the distinction of conclusively establishing the existence of the obscure internal secretion of the corpus luteum which stimulates the remarkable change now known as the "decidual reaction," and the loss of which in the first trimester of pregnancy—as by ovariectomy—so profoundly alters embryonic development as to inevitably result in abortion. Without the presence of the corpus luteum the endometrial changes of early pregnancy fail to develop, the uterine mucosa not being sensitized by the occult influence of the hormone secreted by the lutein-cells.

b. *The Mechanical or Irritative Theory.*—Certain physiologists claim that the decidual growth is induced by a direct mechanical irritation or stimulation of the endometrium by the impregnated ovum. Loeb (1909) has shown that any unusual mechanical interference will answer, the ovum not being an essential factor in the process. The interesting question of the orientation of the ovum is thus brought up, together with the peculiar processes by which this localization is accomplished. Much light has been thrown upon this obscure matter by the labors of the biologists who have noted the curious fact that in certain animals—notably the guinea-pig and the mouse—the decidual reaction begins to appear only after the developing ovum has corroded the superficial epithelial layers of the endometrium.

*The Trophoblast and Its Destructive Property.*—The phenomenon of the orientation of the ovum has been concisely presented by Minot (1904) in the following manner: "The human ovum produces upon its exterior surface during its earliest stages of development a thick layer of cells known as the *trophoblast*. The function of the trophoblast is to corrode away a portion of the mucous membrane of the uterus, making a cavity in which the ovum lodges." This work accomplished, the trophoblast undergoes a hypertrophic degeneration, "such as to produce a series of irregular spaces which persist and become the intervillous spaces of the placenta. Papillary outgrowths of the chorionic mesoderm meanwhile penetrate the trophoblast,

initiating the formation of the chorionic villi. The trophoblastic cells covering each of these mesodermic outgrowths persist in two layers—the inner, cellular in nature (*Langhans' layer*), and the outer, the *syncytium*. These two layers represent the first stage of the villous ectoderm.”

Herzog (1909), of Chicago, emphasized the fact that the trophoblastic cells are not phagocytic in the ordinary sense of the word; and he offered the suggestion that the destructive property of the trophoblast lies in an enzyme secreted by its cells, which enzyme “diffuses into the surrounding maternal tissues and causes coagulation-necrosis and complete degeneration of cells.” Thereby is formed the *Nitabuch fibrinoid stria* lying on the surface of the decidua next to the chorion and produced apparently by the syncytial layer of the chorion. Herzog remarked that this destructive action of the trophoblast “is the exact picture of malignant tumor-proliferation, while the reaction of the maternal tissue reminds one of a profound destructive hemorrhagic inflammation.” The arrest of the trophoblastic corrosion results from the establishment of a temporary immunity of the maternal tissues to the hormonal action, or is due to a suppression of the trophoblastic secretion at the close of the first trimester of pregnancy.

*Both Etiologic Factors Co-active.*—It is now generally accepted that both the chemical and the mechanical factors of decidual stimulation are operative, neither being effective in the absence of the other. Outerbridge (1912) has clearly expressed this belief as follows: “Loeb’s interesting experiments have shown—at least for rabbits and guinea-pigs—that the primary factor in the formation of uterine decidua is the presence in the circulating body-fluids of a hormone developed in the corpora lutea; that the uterine mucosa, being sensitized by the presence of this substance, will respond by the formation of a decidua to any nonspecific irritation—such as deep incisions into the uterine wall, the introduction of bits of glass-tubing or other foreign substances into the uterine cavity—even though the ovum be entirely excluded from entrance into the uterus by ligation of both tubes. If this theory, that the sensitizing influence arises in the ovary, and not in the developing ovum, is correct, the seat of the fetal attachment would appear to exert no influence whatever on the formation of decidual cells except by acting as a mere mechanical irritation to the fixed connective-tissue cells of that region. Just how far this theory applies to the formation of extrauterine decidua cannot be stated. Loeb has not been able to produce decidua outside the uterus, but the practically physiologic development of decidua nodules in the peritoneum and ovaries in normal pregnancies would seem to indicate that it may, in part at least, hold true for these situations as well. If the sensitizing hormone is the essential factor, and this

arises in the corpus luteum, it would be natural to expect to find the ovarian stroma, at least that of the ovary containing the corpus luteum and upon which its secretion must work in its fullest concentration, the seat of extensive decidual change. The fact that this change has been comparatively seldom observed in the omentum \* \* \* would seem to indicate that under ordinary circumstances that organ either does not come extensively under the influence of the ovarian hormone, or that if it does come under this influence mechanical stimuli are wanting to call forth a decidual reaction."

#### THE PROTECTIVE FUNCTION OF THE DECIDUA

These facts having been determined, as far as the limited knowledge of the subject will permit, it is logical to inquire as to why the decidual reaction is necessary in pregnancy, normal or otherwise. Johnstone (1914) states that it was Sir William Turner who first promulgated the view that the reaction is protective of the maternal tissues, the formation of the decidual cells always being accompanied by a leucocytic infiltration of the tissues in which they appear, as Meyer (1911) has demonstrated. This would seem to indicate a *quasi*-inflammatory reaction designed to limit the invasion of the maternal tissues by the chemico-mechanical stimulus. Murray (1913) expresses this view clearly when he says that there is "the most complete evidence that a normally pregnant animal is actively protecting itself from something injurious in its own placenta." This antagonistic element in the maternal fluids is proved by the fact that "any excursions of syncytial cells into the blood-stream is met with the death and disintegration of those cells" (Foulkrod, 1913). Closely associated with this theory, obviously, is the fetal or placental theory of the etiology of the pernicious vomiting of pregnancy.

Johnstone also claims that "the decidual reaction is in all probability indirectly but equally protective to the embryo, in that, by supporting and strengthening the maternal capillaries, it prevents a too sudden and too extensive opening up of these vessels—the probable consequence of which would be to tear up the delicate attachments of the ovum." The formation of decidua must, accordingly, be regarded as a mutual protection for mother and fetus.

#### THE DECIDUAL REACTION IN ECTOPIC PREGNANCY

The decidual cast of a tubal pregnancy is a familiar object to the gynecologist; it is an invariable accompaniment of ectopic gestations progressing to two months or more. Such a cast also forms in the unimpregnated horn of a didelphic uterus, as in a case reported by Stevens (1913-14), in which the cast presented the ordinary appearance of that thrown off in an ectopic pregnancy, with the absence of the fetal elements, save that it was larger and bulkier.

Microscopically it was identical with normal decidual tissue, showing the decidual cells, the interglandular cells, and the remains of the uterine glands.

The decidual reaction in ectopic pregnancy presents two distinct phases, namely, the reaction as occurring in the uterine cavity, and that occurring at or near the site of ovular implantation. It may be stated that, as a general rule, in ectopic gestation the decidual formation is more marked away from the ovum than at the place where it lies imbedded (*Taussig*).

a. *The Intrauterine Decidua in Ectopic Pregnancy*.—How early the uterine mucosa shows a change in tubal or other forms of ectopic pregnancy is not definitely known. *Taussig* (1906) states that it is only from the second month that a uterine decidua is found in ectopic pregnancy with any degree of regularity, and that it is but very rarely found in the case of early tubal abortion; while *Johnstone* remarks, "there is no evidence to indicate that the uterine change in such cases occurs before the ovum has imbedded itself in its abnormal situation." He believes, with *Loeb*, that the change results from a biochemical influence consequent upon the invasion of the ovum wherever located, this influence being blood-borne from the trophoderm; and he regards the uterine reaction in tubal pregnancy as "a praiseworthy but misplaced effort on the part of the maternal tissues to counteract the trophodermic influence." This intrauterine reaction is most marked when the pregnancy is situated in the isthmus of the tube.

*Sampson* (1914) claims that it has begun to appear by the end of the first month and soon after shows the two characteristic layers covering the entire intrauterine area. The *compacta* steadily increases in thickness with the progress of the tubal gestation. In the earlier cases it forms not more than one-fifth of the thickness of the vera; but in the older pregnancies, as when the fetus is 6 cm. in length, it comprises more than one-half of the vera. It contains numerous spaces filled with venous blood. The *spongiosa* contains numerous hypertrophied glands closely packed together, between which extend trabeculae uniting the compacta with the myometrium, and carrying minute arterioles and venules. The arterioles are spiral in their course, as distinguished from the venous spaces of the endometrium, which exist everywhere in the endometrial stroma but are most marked at the junction of the compacta and spongiosa.

*Van Tussenbroek* (1893) notes, as the characteristic features of ectopic intrauterine decidua, a direct emptying of the glands into the uterine cavity; an absence of fibrinous streaks such as are present in normal pregnancy; and an opening of the capillaries directly into the uterine cavity, whereby the customary bleeding of ectopic pregnancy

results. Werth (1904) claims that there is no proliferation of the glandular papillæ in ectopic pregnancy such as always occurs in normal pregnancy (Opitz, 1903).

The entire intrauterine decidua of ectopic gestation is shed in shreds or granules at the time of tubal rupture or is discharged as an intact cast of the uterine cavity.

b. *The Tubal Decidua*.—Most tubal gestations are located in the ampulla of the organ, and the vast majority of these tubes are healthy in every respect. The reason for the orientation of the fertilized ovum in the tube instead of in the uterine fundus must, therefore, be a retardation in the transmigration of the ovum, after fertilization, from the ovary to the uterus, with a consequent development upon it of the corroding trophoderm which should not appear until the uterine cavity is reached. The abortive effort at decidual formation within the pregnant fallopian tube is, therefore, according to Johnstone, probably protective in nature.

There at once develops in the tube a series of phenomena identical, with but slight variations, with those occurring in the uterus normally impregnated, but to a decidedly less degree. Bartelmez, indeed, states emphatically that as far as his experience goes "the great development of the stroma which characterizes the uterine decidua vera has never been observed in a tube." The changes which have been noted by other observers consist in a trophodermic corrosion of the superficial tubal epithelium, which, in the absence of the thick and edematous subendometrial tissue, exposes the musculature of the tubal wall, into which the ovum penetrates and orientates; the imperfect formation of a fibrinous or partially muscular *capsularis* or capsular membrane; and the formation of a very imperfect and irregularly distributed decidua, the cells being few and widely separated. The same changes are noted in the rarer fimbrial gestations. In those cases in which the ovular implantation occurs in the narrow isthmus of the tube in the uterine wall (*interstitial pregnancy*), both the intrauterine decidua and the attempt at the formation of a tubal decidua are well-marked.

As Caturani has noted, the microscopic changes include an increase in the thickness of the tissue representing the submucous stroma, which also becomes corrugated and irregularly nodular on the surface; it contains a few decidua-like cells. "There are glandular-like invaginations of the epithelium into the submucosa, and an active proliferation of the endothelium of some blood-sinuses in the submucous stroma." A striking feature is that "the stroma has a very loose appearance, and the decidua-like cells are widely separated, never as close one to the other as in the uterus." These cells, Waegeli (1915) claims, cannot be attributed to their proximity to the uterine cavity, since they are found as well in the sections of

the walls of the fetal sac distal from the uterine cavity. Caturani believes that the prevalence of the inter-cellular fibers in the stroma of the tubal mucosa will account for the sparsely grouped cellular appearance of the tubal decidua, and that the absence of glands in the tube can easily explain the absence of a definite spongy layer.

The characteristic features of the tubal decidua, according to Caturani, are the disappearance of the surface-epithelium; an increase in the number, with modification, of the round cells of the stroma which gradually develop into decidua-like cells; a marked round-cell infiltration of the stroma; a typical arrangement of the modified stroma into rounded or columnar elevations; and an abundant network of blood-vessels and sinuses at the junction of the decidua with the subjacent tissue. A thin lamella of fibrinoid material (*Nitabuch's layer*) covers the columns as well as the reflexa and vera.

There is not the same sharp differentiation between the fetal and maternal structures as in intrauterine pregnancy; at least, this is true of the early tubal pregnancies. There may be noted more or less intermingling of the plasmodial or syncytial elements within the decidual columns. "The Langhan's cells are comparatively few and rather grouped with the plasmodium, which seems to play mainly the rôle of breaking through the decidua and decidual sinuses to secure the trophic changes for the ovum" (*Caturani*). The ill-defined region in which the maternal and fetal elements are more or less commingled and apparently engaged in deadly conflict has been aptly termed the "border zone." As has already been stated, Bartelmez has not been able to find a true decidua in the very early tubal pregnancies he has studied, and it may be that in these very young cases the ectopic decidual reaction has not yet begun to manifest itself. The syncytium (syncytiotrophoderm) in tubal gestation is, however, according to Johnstone, "always well-marked, being uniformly arranged over the outside of the entire chorionic membrane, and is always easily recognizable. \* \* \* The syncytium is, in reality, the outer layer of the trophoderm."

#### ECTOPIC DECIDUAL REACTION

A curious phase of the decidual reaction is that phenomenon which seems to have disproved conclusively Webster's theory of decidual specificity for the uterine mucosa. Webster stated his belief that the Müllerian tissues only could generate a decidua—at least in man—and that the reaction occurred occasionally in the tube only as the result of faulty development. Since his memorable contribution, however, decidual tissue has been found in other locations, as the peritoneum, the ovary and the appendix, in the course of normal and ectopic gestations, and also in these places and in the cervix uteri in certain nonpregnant conditions. The investigations of Loeb (1908),

Taussig (1906) and Outerbridge (1912), all in this country, have been invaluable in establishing these facts for all time.

Taussig, who remarks, in a paper read before this Society sixteen years ago, that "in a considerable percentage of all pregnancies, no matter what the site may be, a formation of decidua-like cells is found outside the point of implantation of the ovum, even at a considerable distance from it," gave to this phenomenon the term "ectopic decidua formation," which has become generally accepted by the profession.

Webster, in 1903, first called attention to the fact that decidual tissue can be traced in some cases of normal gestation from the uterine cavity into the inner end of the nonpregnant tube for a varying extent. His observation has been substantiated by Williams (1901), Lange (1902), Mandl and others. An extension of the decidua into the nonpregnant tube has also occasionally been noted in tubal pregnancy. Taussig, in 1906, remarks that "we find in normal intra-uterine gestation, so frequently as almost to be termed physiological, clusters of decidua-like cells beneath the pelvic peritoneum, on the surface of the ovaries, and in the mucosa of the tubes. In tubal pregnancy we find an extensive decidua in the uterus, and occasionally at various points such as the nonpregnant tube, the serosa of the appendix, the omentum," and elsewhere. He reports a case of primary pregnancy of the fimbria ovarica, becoming a secondary abdominal pregnancy, with unusual decidual formation, including small patches in the mucosa of the upper cervical canal (the only case on record), as well as a remarkable layer of decidua, four or five cells in thickness, largely surrounding an accompanying parovarian cyst. Voigt (1898) reported the presence of decidual tissue in two accessory fallopian tubes in a case of fimbrial pregnancy; and Webster (1904) noticed decidua-cell formation near the site of implantation of the ovum in a case of ovarian pregnancy. In this connection, the curious case of ovarian pregnancy reported by Sencert and Aron in 1914 should be noted, in which case the early death of the embryo occurred, but the placenta and decidual tissue continued to grow and develop for two years, when they were removed by operation.

Thus far, as Taussig has noted, ectopic decidua has been encountered in the cervical mucosa; in the nonpregnant tube of an extrauterine pregnancy, and in both tubes in intrauterine pregnancy; on the uterine peritoneum; in the pelvic and parietal peritoneum; in the ovaries; in the serosa of the small intestines; in the omentum; in the appendix; and in certain pathologic structures (bands of adhesions, adenomyomata of the uterus, parovarian cyst).

*Peritoneal Decidua.*—Walker, in 1887, first demonstrated the presence of the decidual reaction in the peritoneum in a case of abdominal pregnancy; and Dobbert, in 1891, noted a similar change in a tubal

gestation. Both these observers thought that this peritoneal involvement was possible only in ectopic pregnancy. It was Pels Leusden, in 1895, who first called attention to the presence of patches of decidual tissue in the pelvic peritoneum in normal intrauterine pregnancy. In 1897, Schmorl found the same condition in seventy normal cases, the patches occurring most commonly on the posterior uterine surface, but also appearing on the anterior peritoneal investment of the uterus in cases complicated by adhesions to the tubes and other adjacent structures, notably the posterior wall and fundus of the bladder. In 1901, Stravoskiadis noted a development of decidual tubercles over the anterior parietal surface of the rectum, the posterior surface of the uterus, and the floor of Douglas' culdesac in fifteen cases of intrauterine pregnancy. In 1902, Kinoshita found similar tissue in Douglas' culdesac and elsewhere in eleven puerperal women; and the same year Lange, and subsequently Curtis (1915) and others have confirmed these findings. Patches of decidua-like cells have been noted on the parietal pelvic peritoneum by Schmorl (1897), Amos (1905), and Tuholske (1901), the latter in a case of secondary abdominal pregnancy. The peritoneal covering of the fallopian tube and the broad ligament have been involved in certain cases.

Schmorl states that these peritoneal patches of decidua may attain a thickness of from 2 to 3 mm. They appear as whitish tubercles or nodules varying in size from that of a fine shot to that of a pea. They are found not only just beneath the surface, but also in the deeper layers of the peritoneum or subperitoneal connective tissue, from the loose cells of which they take their origin.

They are not metastatic in nature, shot off from the intrauterine decidua, but are due, according to Outerbridge (1912), to a direct "transformation *in situ* of the subserous connective tissue cells, analogous to that occurring in the uterine mucosa." This observer further states that it is "almost always possible to demonstrate numerous intermediate stages, between the small, unchanged, fixed connective tissue cells and the large, pale, fully-developed, round, decidua-like multinucleated cells."

*Omental Decidua.*—Outerbridge (1912) has proved that decidua-like cells may be found in the omentum in cases of intrauterine pregnancy. He states that "the first to report decidual reaction in the omentum was Prochownick, who, in 1899, demonstrated a case of tubal pregnancy" which had aborted through the fimbriated extremity and continued to grow for seven months, the greater omentum comprising the chief component of the fetal sac. Scattered extensively throughout it "were large numbers of characteristic clumps and nests of decidual cells." Schmorl, in 1902, recorded the presence of decidual tissue in the nonadherent omentum in three



cases of intrauterine pregnancy; and the same year Lange reported a case of intrauterine pregnancy in which "groups of characteristic decidua cells were found just beneath the serosa in small multiple fibromata of the omentum." Penkert, in 1905, first carefully investigated the subject of omental decidua, his case being one of ectopic gestation in which decidual cells were found in the fatty structure of an adherent omentum, obviously springing from the cells of the fat tissue. Finally, Outerbridge, in 1912, recorded a case of abdominal pregnancy at or past term, operated upon at the Preston Retreat of Philadelphia by Drs. Richard C. Norris and E. P. Barnard, "in which the omentum, which had afforded attachment for the placenta, contained clearly defined groups of characteristic decidual cells," quite an extensive formation of decidua being found.

Omental decidua occurs either as small, white, pedunculated nodules of about the size of a pin-head or as small, grayish, translucent, flattened plaques, and these deposits are attached generally to the under surface or lower margin of the organ.

*Ovarian Decidua.*—Schmorl (1897) believed that decidual tissue invariably occurred in the ovaries in both normal and ectopic pregnancy. The so-called decidual cells are usually "found in the outer layers of the stroma" and occasionally also "in small groups deeper down in the neighborhood of small veins." Kinoshita (1898), Schnell (1899), Lindenthal (1901) and other observers have confirmed these findings. Taussig (1906) states that "Webster found decidual changes in four out of ten ovaries of normal uterine pregnancies. In each case the areas were situated about the surface, and the line of demarcation was distinct. Usually these areas contained dilated blood vessels." Lindenthal found decidual tissue in the ovaries of both normal and ectopic gestation in fifteen out of thirty-four cases after the third month. The spindle-cells of the albuginea had undergone the transformation into the decidua-like cells, and the process increased in intensity up to the seventh month and then showed a retrogression. Webster records an ovarian pregnancy in which the decidual formation was found in the gestation-sac near the large blood spaces surrounding the hilum of the ovary.

*Appendiceal Decidua.*—In 1905, Herschberg reported the occurrence of decidua-like cells in the serosa of the adherent appendix in a case of an extinct right tubal gestation. The serous coat was greatly thickened, and in its deeper layers numerous fairly large groups of typical decidual cells were found, having taken their origin from the connective-tissue cells of that region. In 1913, Outerbridge proved by two cases of appendicitis complicating intrauterine pregnancy—one occurring at six months, the decidua-like cells appearing in the serosa of the nonadherent appendix; and the other developing during labor and ending fatally the following day, the serosa of the

appendix containing groups of typical decidual cells—that it is not necessary for the appendix to be adherent to the gestation-sac nor for the pregnancy to be ectopic in nature, for the occurrence of the decidual reaction in the tissues of the appendix. Taussig (1906) concludes that “the decidual reaction in the appendix cannot be considered a uniform procedure, but is probably exceptional and dependent partly on the duration of the pregnancy, partly on the extent of the decidual reaction found elsewhere.” Apparently, the tissues of the appendix do not readily respond to the decidual stimulus.

*Vaginal Decidua.*—A unique case is that recorded by Freund, in 1911, in which small nodules of decidua-like cells were found in the vagina of a woman who died of septic abortion in the third month of gestation.

*Decidual Reaction in Pathologic Tissues.*—Taussig recorded, in 1906, a case of tubal pregnancy complicated by a parovarian cyst, in which extensive decidual formation was noted in the cyst-walls which were adherent to the gestation-sac. Amos, in 1905, and Cameron, the same year, each recorded a case of adenomyoma of the pregnant uterus in which decidua-like cells were noted in the mucosa of the tumors. As Taussig has noted, adhesions “seem to further the development of decidua, since in such cases they are very extensive.” The peritoneal covering of adherent loops of bowel occasionally shows the decidual reaction, and the adhesions themselves generally show deposits of decidua-like cells.

#### CONCLUSIONS

The subject of ectopic decidual reaction is of too recent development and the clinical material too scanty as yet to arrive at any definite conclusions. Outerbridge has covered the matter satisfactorily when he remarks that “ectopic decidua appears, on the whole, to be extremely fitful in occurrence, a circumstance which may be ascribed to variations in the intensity of action of the ovarian hormone, to different degrees of responsiveness on the part of the subperitoneal connective-tissue cells, or to the presence or absence of suitable local stimuli, each of these factors undoubtedly varying greatly in individual cases.” Taussig’s suggestion that the superficial location of the ectopic patches would seem to indicate that the end-products of the normal decidual reaction do not reach these points through the blood or lymph-channels, but that the placental substances pass directly through the lumen of the tubes and out through the fimbriated extremity to reach the ovarian and pelvic peritoneum where they produce sufficient irritation to cause a decidual reaction, is also worthy of consideration. This theory would seem to offer a satisfactory explanation for the comparatively great fre-

quency of the patches in the peritoneum of Douglas' culdesac, the posterior surface of the uterus and the rectal walls, the irritating material naturally draining into this region.

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## OBSERVATIONS UPON THE PATHOLOGY AND TREATMENT OF HYDATIDIFORM MOLE†

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**H**YDATIDIFORM moles, noted but rarely in the practice of individual obstetricians, with their bizarre appearance, the rather startling nature of their usual manifestations and the fact that treatment seems so obviously to point to a simple evacuation of the uterine cavity, have combined to make the study of these teratomata interesting and profitable to the pathologist, while they offer no special inducement for investigation at the hands of the clinician.

As a natural result there is a rich and voluminous literature relating to the pathology, structure and genesis of these growths, while the management of the condition has excited but scant comment.

Observation of a series of cases has led the writer to formulate certain conclusions concerning the matter, which have been forced upon him by experience. There has been no attempt made at a generalized study of the subject, the literature on such analyses being abundant. Attention is directed to the monograph of Essen-Møller, "*Studien ueber die Blasenmole*," (Wiesbaden, 1912), and the paper of Palmer Findley.<sup>1</sup>

\*A more complete bibliography is presented in the author's reprints.

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With regard to the frequency of occurrence of hydatidiform mole, there seems to be no basis for definite statements. Boivard found one in 20,000 obstetric cases. Essen-Møller gives the frequency at the Frauen Klinik at Lund as three per 1000. Krönig found one mole in 728 pregnancies, the statistics varying in such wide degree that no definite conclusions are possible.

It does seem true that moles occurring in ova aborted early in pregnancy are common. Indeed Meyer<sup>2</sup> makes the statement that "mole formation is a rare disease at or near term, but it probably is the commonest of all diseases of the ovum during the earlier months of gestation. The typical large hydatidiform mole is an end result which it has taken long months to develop. No one seems to have followed its evolution, although hydatidiform degeneration whether total or partial is, of course, gradual in its advent."

The structure of hydatidiform mole is a matter of common knowledge and requires no comment here. The variations in type of these growths, however, deserve more emphasis since the tendency toward malignant degeneration varies directly with the degree of invasive ability of the syncytial cells.

This point has been well brought out by Caturani,<sup>3</sup> who holds that the difficulty in determining the future course of hydatidiform moles is dependent, not so much upon the insufficient knowledge of the differences in the activities of the chorionic proliferation as upon the difficulty of securing the evidence of the uterine invasion.

The limitation of curettage, which is deemed to be incomplete in the best circumstances, is greatly increased in the uterus generally softened and friable from the presence of the mole. Caturani advises anterior vaginal hysterotomy, with removal of a small portion of the uterine wall for study, as the most logical procedure.

The writer is not in accord with the theory that endometritis is an important etiologic factor in mole formation. Inasmuch as endometritis is at best a very questionable pathologic entity, and especially since moles are entirely a disease of fetal structure, the decidua not being involved, it is difficult to associate them with any lesion of maternal tissues, except insofar as trophic or nutritive errors may be causative.

The true etiology seems to lie in some specific fault in development of the chorionic villi, rather paralleling the development of general edema of the fetus and similar degenerative and proliferative phenomena whose modes of origin remain entirely unsolved.

Agreeable to this view is the interesting theory formulated by Balantyne,<sup>4</sup> who inquired as to what happens in a blastocyst, when for some reason or other, the embryo entirely fails to appear, and answers his inquiry by the statement that "if we imagine an early ovum, like

Peters', implanted in the uterine mucosa but with no embryo in it and no developing system of blood vessels, then by the continuing proliferation of the trophoblast, it might soon take on an appearance resembling that of the hydatid mole. It may be objected that an embryo is sometimes found in a mole, but this occurrence is very rare and may, when it does occur, be regarded as a twin pregnancy in which one twin is represented by a hydatidiform mole."

The statement that the occurrence of an embryo in a mole is very rare, is disproved by the statistics of the Mall collection (Meyer), many of which were early specimens, the average age being 66.6 days or  $2\frac{1}{4}$  months and of these 64.4 per cent contained fetuses, the latter in an excellent state of preservation in some of the earlier cases.

This does not entirely discredit Ballantyne's view, however, since it is perfectly conceivable that in these cases there is an unbalance between the chorion and the embryo, and that excessive chorionic development results in the active proliferation before alluded to.

It is sufficient to say that with our present knowledge of the subject, the etiology of mole formation is not known, but the evidence seems to point to its being a true teratomatous phenomenon, the changes taking place in the embryonal envelope rather than in the embryo itself.

Concerning the question of the existence of a well developed mole and a living infant, there is one case reported by Meyer (q.v.) which is of such unusual interest that it is here reproduced.

CASE NO. 1914. This specimen from the Mall collection filled a two liter jar and was said to have accompanied a living seven months' fetus, having been expelled between the fetus and the placenta. Only a small amount of clot and what seemed to be a small portion of placenta and membrane accompanied it. Since the placenta was not saved it is impossible to say whether the mass resulted from partial degeneration of the placenta belonging to the living child or whether it represented a degenerated living placenta, which is rather unlikely but not impossible, in view of the well authenticated cases found in the literature. This specimen is of interest not only for the numerous, large clear cysts, one of which measures 30x25 mm., which it contains, but because it accompanied the birth of a living child and because of the relative rareness of such a coincidence. According to J. W. Williams such an occurrence has not been observed in a series of over 17,930 obstetrical cases treated by the department of obstetrics of the Johns Hopkins Medical School.

The treatment of hydatidiform mole is the phase of the subject which seems to require most careful scrutiny and, in the opinion of the writer, radical revision.

An analysis of the standard text books of obstetrics used as teaching references in American medical schools reveals the following practically universal treatment of hydatid mole: Curettage of the uterus with particular care against perforation, packing in the event of severe hemorrhage. Observation of the patient for from two to three years, in order to guard against the development of chorion-

epithelioma. The mortality following this lesion, based apparently upon the results of the accepted treatment, is appalling, if the statistics are considered to be accurate.

In Findley's 500 cases the total mortality was 22.5 per cent, according to Edgar it is 13 per cent, Williams 10 to 26 per cent, and Hirst 18 to 25 per cent.

Such a death rate is the highest following any obstetric complication save only puerperal sepsis and premature separation of the placenta; it is entirely too high and should be markedly lowered. The causes of death are given as sepsis, hemorrhage, peritonitis following traumatic perforation of the thinned out uterine wall and the development of chorionepithelium.

With regard to the first three sequelae there seems to be no doubt, but the question of chorionepithelioma is a vexed one.

In the 500 cases analyzed by Findley, chorionepithelioma developed in 157 or 31.4 per cent, though as Findley well says it is impossible to determine just what proportion of hydatid moles undergo malignant change since ordinary benign moles are not usually reported, while those which undergo malignant change are reported with greater frequency.

Caturani records seven cases of chorionepithelioma which came under his observation and treatment.

On the other hand, a pathologist of such wide experience as Symers,<sup>5</sup> states that he considers this tumor one of the rare lesions. His letter is of such interest in this connection that it is quoted in part.

"Among approximately nine thousand autopsies performed under the auspices of Bellevue Hospital, not a single chorionepithelioma has been encountered. Since the abolition of the Coroner's system and the establishment of the Office of the Chief Medical Examiner, three thousand additional autopsies in medico-legal cases have been done in this laboratory, but without finding an example of chorionepithelioma. Since the foundation of the pathological laboratories of Bellevue Hospital fourteen years ago, we have examined many thousands of tissues removed at operation, but our records include but one example of chorionepithelioma, namely, a metastatic growth in the vulva. In the same length of time twenty hydatid moles have come to our notice. In the course of the past fifteen years I have been connected at various times with the pathological laboratories at the New York City Hospital, the New York and Hudson Street Hospitals, St. Vincent's and Bellevue, and have seen but two autopsies on subjects dead of chorionepithelioma. Dr. Charles Norris, Chief Medical Examiner of the City of New York, whose experience in postmortem work has been far more comprehensive than mine, tells me that he has encountered this tumor only very rarely.

It seems to me that in arriving at a diagnosis of chorionepithelioma as the result of microscopic examination of tissues removed at operation, one should proceed with the utmost caution, in view of the fact that placental remnants may live in the uterus for a considerable length of time after the termination of pregnancy, that syncytial cells may wander widely even in normal circumstances, and that mechanically displaced chorionic villi may be sometimes found in the uterine, pelvic and vaginal veins after severe labor.

However true all this may be, the fact remains that, in my experience at least, genuine chorionepitheliomata of the uterus, that is to say, tumors that spring from the fetal side of the placenta and are locally destructive and metastasize widely, are most uncommon."

It must be conceded, then, that the relative frequency of malignant

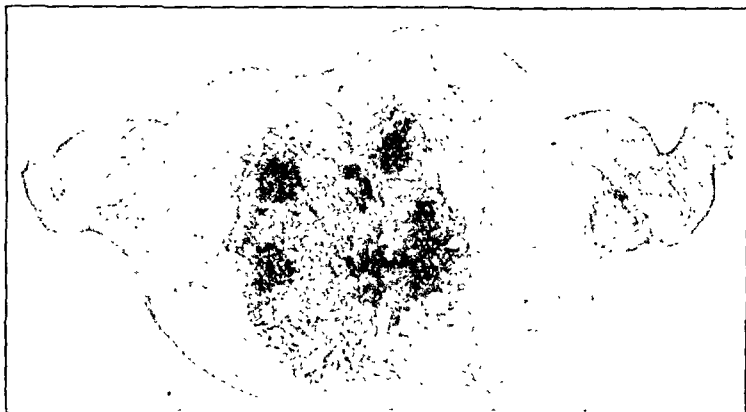


Fig. 1.—Case 194 B. Uterus after the expulsion of a hydatidiform mole. Note areas of deep invasion of uterine muscles.

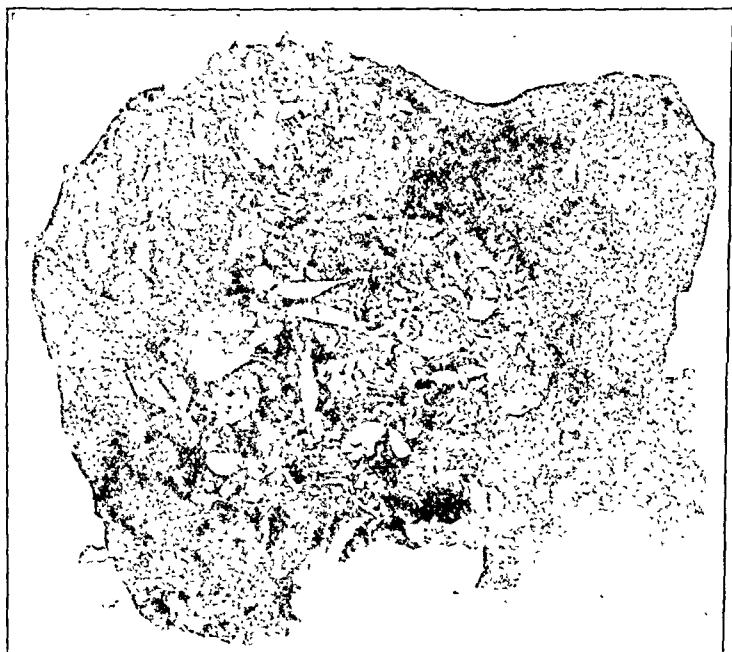


Fig. 2.—Case 194 B. Hydatidiform mole expelled spontaneously from uterus in Fig. 1.

change in hydatid mole remains unsettled, our knowledge of the subject being too vague to arrive at definite conclusions.

If the facts above stated be summed up, it appears that in cases of hydatidiform mole formation there is a maternal mortality of certainly 15 to 20 per cent. That from the very nature of the morphol-

ogy of these moles it is impossible to ascertain even by examination of a portion of the extruded tissue, how widespread and deep is the invasion of the uterine muscle and because of this ignorance one is unable to determine whether sepsis from retained portion of mole, hemorrhage, or malignant change is likely or unlikely to develop in any given case.

In view of these facts, it seems rational to the writer to regard every hydatid mole clinically as a malignant tumor, carrying with it a high mortality, and in consequence to attempt no half-way measures for the removal of such growths, but to extirpate them, together with the fundus of the uterus.

This somewhat radical viewpoint is by no means original, it having



Fig. 3.—Section from uterine wall of uterus in Fig. 1 showing implantation of nests of syncytial cells deep in the muscle together with several small intramural hemorrhages.

been proposed by Freund, years ago and reiterated by Essen-Møller and Howard Taylor, especially when bleeding is profuse, the cervix rigid, and the patient near the climacteric.

The writer does not admit these limitations to hysterectomy, and feels that the more radical treatment should be a routine if the mortality is to be greatly reduced.

The procedure in detail is as follows: Upon the diagnosis of hydatidiform mole being established, no vaginal work is done whatever. Laparotomy is performed, the uterus isolated by gauze packs and an abdominal hysterotomy is done, the mole being inspected *in situ*. Should it be distinctly limited in attachment to the decidua, and show none of the little hemorrhagic areas in the uterine muscularis, which



bespeak invasion of the uterine wall, the tumor may be shelled out and the uterine wound closed, after the cavum has been disinfected with iodine.

Should areas of invasion of uterine muscle be present, however, and this is true in the majority of cases, no attempts are made at shelling

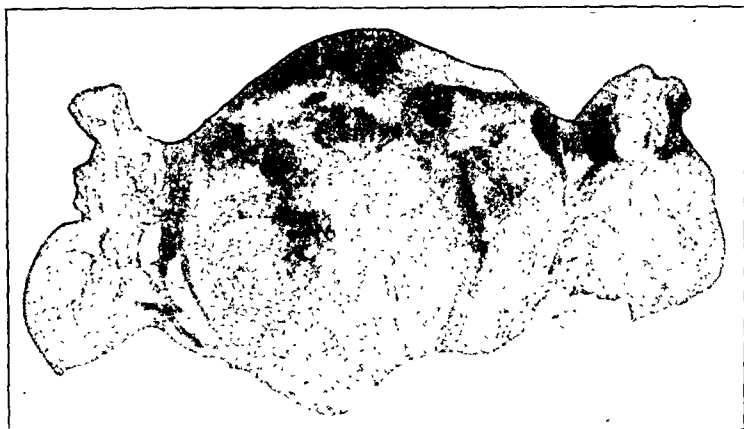


Fig. 4.—Case 631 B. Uterus after expulsion of hydatidiform mole. Several areas of deep invasion of the musculature, though not so marked as in Fig. 1.



Fig. 5.—Structure of mole expelled from uterus in Fig. 4, showing usual structure of the vesicles.

out the tumor, but an immediate supravaginal hysterectomy is performed, the only exception to this plan being in the case of a primipara desirous of family to whom the situation has been carefully explained and who is willing to assume the risks of either curettage or abdominal hysterotomy with removal of the mole by this route.

By the routine employment of the technic described, it would seem that the enormous mortality following the occurrence of hydatidiform mole may be greatly reduced.

Three case histories are appended to show the characteristics of these growths and especially the findings upon hysterectomy.

CASE 194 B.—Mrs. S., forty-seven, xii para. Admitted to Frankford Hospital with a history of amenorrhea for six months, with an irregular bloody discharge for the past month. On examination the uterus was found well above the umbilicus, the cervix dilated to admit one finger. Blood examination showed hemoglobin 60 per cent, red cells 4,400,000, white cells 9200. Twelve hours after admission this patient expelled a large mole (Fig. 2), with considerable hemorrhage. Supra-vaginal hysterectomy was performed with the removal of a uterus 15 cm. in length. On section the organ presented the appearance shown in Fig. 1. It is apparent that with the degree of invasion of the uterine wall by this mole, both as determined

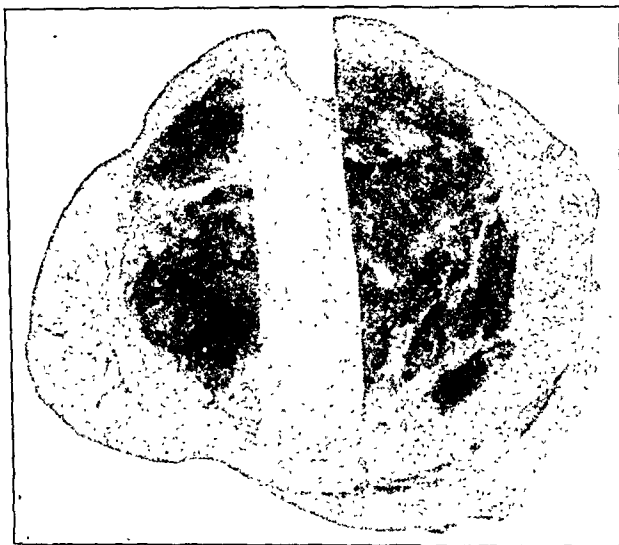


Fig. 6.—Uterus with a firmly attached mole, partly vesicular, partly carneous.

by inspection and as authenticated by histological examination (Fig. 3), curettage could not possibly remove all the growth, and that a fairly large area must remain as a potential focus for infection or malignant change.

CASE 631 B.—Mrs. C., thirty-eight, iv para, was admitted to Frankford Hospital with a history of pregnancy for six months, and irregular bleeding. Shortly after admission she expelled a moderate sized mole of the usual benign vesicular structure as shown by the section. (Fig. 5.) The hemoglobin was 40 per cent, red cells 2,470,000, white cells 16,400. On the following day hysterectomy was performed, the uterus measuring 10 cm. in length. As shown in Fig. 4 there are several deep areas of invasion of the uterine walls by syncytium, and although the case is one more favorable for curettage than the preceding one, still such operation must be attended with the danger of perforation of the thinned out uterine wall, together with the risk of retention of a portion of the growth.

CASE 1044 B.—Mrs. F. S., thirty, i para, admitted to Frankford Hospital in extremis following severe hemorrhage for four months. On admission the patient was bleeding freely from the vagina, the temperature was subnormal, the pulse

120, blood count revealing 26 per cent hemoglobin, red cells 3,900,000, white cells 5200. This patient on examination had a large, smooth, uterine fundus, extending to umbilicus. The cervix was hard and firm, there was no cyanosis of the mucosa and the concomitant signs of pregnancy were absent. Diagnosis of a degenerating fibroid was made and the patient given hematinic treatment for a week, after which hysterectomy was performed. The uterus measured 15x10 cm. and contained a large firm tumor (Fig. 6) strongly attached to its posterior wall. The tumor was mixed in nature, being partly vesicular and in part firm and fibrous. On microscopic examination the firm portions of the growth were found to consist of organized clot, chorionic villi and connective tissue, while the vesicular portion was characteristic of an hydatidiform mole.



Fig. 7.—Section of uterine wall from uterus in Fig. 6, showing widespread invasion of the muscles by the syncytial cells.

Section of the uterine wall is shown in Fig. 7 and the deep and massive invasion of the uterine muscle by masses of syncytium, is well illustrated. This patient, who was a desperate risk, died of peritonitis on the third day. The others recovered with uneventful convalescences.

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1814 SPRUCE STREET.

(For discussion, see p. 427.)

## PROLAPSE OF THE FEMALE URETHRA AND EVERSION OF THE EXTERNAL URETHRAL ORIFICE\*

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IN this article I shall not consider those lesions occurring in infancy and childhood which might properly be classified under this title, and which have already been the subject of considerable study and the text of numerous papers written for the pediatrician. They would seem to me to have little in common with those found in middle and late life, which, in most instances at least, are due to the trauma of childbirth. We have little literature dealing with the latter, despite the fact that most gynecologists have noted them and have attempted their surgical correction. In a former article<sup>1</sup> I called attention to the fact that they were frequently overlooked by the casual observer. The symptoms are often ascribed to a coexisting cystocele or some other pathologic condition within the genitourinary tract and, since examinations are commonly made with the patient in a prone position and fully relaxed, they may not show themselves. When observed their importance is perhaps underestimated, since many women seem to suffer but little from their presence,—this is especially true when the lesions are of minor degree.

To return to the literature,—some of the best references are to be found in the textbooks of Kelly,<sup>2</sup> Graves,<sup>3</sup> and Anspach.<sup>4</sup> All contain excellent articles calling attention to these, as well as other frequently coexisting defects of the urethra, and offer valuable hints as to their surgical cure. In the periodicals, we find an article by Keefe<sup>5</sup> (discussed by Anspach and Hunner), one by Livermore,<sup>6</sup> who reports a case of eversion of the external orifice of the urethra cured by fulguration, and several other short papers by McCarty,<sup>7</sup> Watts,<sup>8</sup> and Murphy.<sup>9</sup> These deal principally with eversions of the mucosa from the external orifice of the urethra.

The lesions to which I have restricted this paper are frequently a part of other lesions of the urethra and bladder, including especially cystocele and extensive dilatations of the whole urethra, to which I shall only make casual reference. The lesions under discussion, as stated above, would seem to be due to an injury at childbirth, and probably result from the passage of the head of the child through the narrow outlet. The lower end of the vagina and the lower portion or all of the urethra are evidently loosened somewhat

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from their usual close attachments to the pubes, and since those of the vestibule are less disturbed, they roll outward and upward, and from a well protected position within the vulva they become more or less exposed. This is not in evidence when the patient is in a prone position and relaxed, but becomes so when she strains, is up and about, or in the act of urination or defecation. The lower anterior wall of the vagina is thrown into folds which become permanent, and across its surface, running from side to side, one commonly finds two deep grooves a half inch or more apart, between which the mucosa is thick and sometimes hypertrophied and edematous. The urethra does not follow the vaginal mucosa into its fold or folds, but apparently remains straight and closer to the pubes. Under pressure, however, the very end of the urethra changes its direction and tilts upward. Because of the folding of the vaginal wall and the hypertrophy and edema present, the tissues are thicker at this point than usual,—this may be demonstrated in an interesting way by passing a lighted cystoscope through the meatus and following the transmitted light to the bladder.

The most important consequence of the injury remains still to be mentioned, the eversion of the mucous membrane of the urethra. It takes place very often in association with the prolapse of the vaginal mucosa and urethra, but either may be independent of the other. If we examine the urinary meatus in a virgin or nullipara we find it ordinarily very small, and no amount of straining discloses any of the lining of the urethra. In the patients under discussion, however, we find it large and gaping. The orifice seems sometimes to be simply stretched out, at other times torn. Through this orifice the mucosa rolls out under straining and the tender lining of the end of the canal becomes exposed. It occurs in varying degrees. The simplest explanation for this would be that there has been an injury to the muscular coat of the canal. Graves<sup>3</sup> states that senile atrophy is the cause. Commonly when the strain is removed or diminished the mucosa returns to its normal protected position. Occasionally it does not, but remains permanently outside and its folds may become adherent, resisting efforts to return it to the canal.

In lesser degrees of the affection the rolling out of the lining does not take place regularly, but at one or more points the membrane is in advance of the rest and forms little papillary or polypoid projections. They are apt to become extremely sensitive. They are frequently called caruncles. The term is commonly used to include almost any sensitive projection at this point. Graves<sup>3</sup> states that a true caruncle arises from the vestibule and is differentiated from eversions by being covered by squamous cell epithelium. In my ex-

perience a real caruncle is a most uncommon lesion. What are called such are usually eversion. Frequently in examining women in advanced life we see protruding from the meatus a small, very red bit of mucosa which is not sensitive. This is apparently an eversion, but probably because sufficiently protected, causes no symptoms.

I believe that most of the discomfort, when such is present, is caused by an exposed urinary meatus, whether the latter everts much or not. The patient complains of a feeling of soreness and tenderness, there is a burning sensation on urination and sometimes a desire to urinate frequently.

Operations for relief will vary somewhat according to the findings, and whether or not we have other lesions to deal with at the same time. A simple eversion may perhaps best be corrected by a removal of the protruding mucosa, with narrowing of the meatus by a triangular or more or less square denudation made just below the orifice and including part of its circumference. The operation is apt to be bloody, and considerable care is necessary to make the denudation of proper form and large enough. In closing the wound the meatus should be narrowed to its normal proportions. I am placing the sutures deeper than formerly in order to insure approximation for a longer period and prevent separation of the edges and a granulating wound. Where considerable mucosa is removed and a circular incision of the urethra is necessary, the stitches reuniting the mucosa to the edges of the orifice should be rather deep, catching up a fair amount of mucosa, and not tied too tightly. The edges are prone to separate, especially if catheterization is long continued, but I have had better results with continued experience.

The prolapse of the vaginal wall and urethra is best corrected by removing the redundant mucosa by a triangular incision, the base of which runs across the vagina. The apex of the triangle is towards the meatus. The denudation should include all of the redundant mucosa or more. By bringing the edges together the operator may judge as to the amount necessary to be removed. Deep sutures, which catch up first the edges of the mucosa, then the firm tissue beneath the pubes, and finally the other edge of the mucosa, avoiding, of course, the urethra, close the incision and draw the urethra and external orifice back up under the pubes where it belongs. The results are on the whole good, though I have seen partial recurrences of the prolapse.

Where incontinence exists, due to a more extensive dilatation of the urethra, an exposure of the canal by an incision along the anterior vaginal wall and a narrowing of the structures about the bladder neck may be done. Such operations do not properly come within the scope of this paper. They may be combined with those I have described.

When a cystocele exists the operation (now nearly everywhere done) of re-attaching the uteropubic fascia high up on the cervix or uterine wall and bringing it together below this point, combined with the operation described above, in my experience gives excellent results. When an interposition operation is done, if one is careful to remove the redundant mucosa of the prolapsed vaginal wall, and then to bring the fundus down snugly against the pubis, there will be but little protrusion afterwards, or at least it will be rare.

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(For discussion, see p. 431.)

## CLINICAL ASPECTS OF UTERUS DIDELPHYS\*

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FORMERLY abnormalities of the uterus were considered of very rare occurrence and of interest only as pathologic curiosities. Double uterus or uterus didelphys was even judged incompatible with life. Thus Kussmaul<sup>32</sup> as late as 1859 is reported to have said that double uterus occurred only in the stillborn. The first mention of uterus didelphys in the living adult was in 1873 when Fränkel cited the cases of Olliver<sup>38</sup> and Bonnet<sup>43</sup> as the only two recorded cases. It was not until the late nineties that the importance and frequency of this condition became generally accepted. Pfannenstiel<sup>47</sup> was the first to make a definite contribution in this direction, when in 1894 he tabulated 12 cases of uterus didelphys in adults. His report was followed by others and interest in this subject at once was aroused. In 1895, Giles<sup>19</sup> reported from the literature 21 cases of uterus didelphys, including one of his own. Since then numerous cases have been reported. Today this condition, while not of frequent occurrence, has become of sufficient importance to demand the attention of every practitioner of medicine.

For purposes of this paper 54 cases of uterus didelphys collected from the literature in addition to the case reported in detail from the Clinic of Obstetrics and Gynecology of the University Hospital, will be utilized. Only those cases presenting two distinct fundi, each with its own cervix, were considered in collecting these cases. Many reports of so-called uterus didelphys are too inaccurate to be included

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as *bona fide* cases. No doubt there are many unreported and undiagnosed cases, especially when we realize the great increase in the number of cases recorded during the past ten years, due probably to better facilities and more careful examinations.

The term didelphys is derived from the two Greek words meaning double uterus. More accurately however, the condition consists of two distinct and complete halves rather than a true reduplication of the normal uterus. This is shown by the fact that each uterus has only one set of ligaments and appendages, arising from the lateral border in each case. The cervix of each uterus communicates with the vagina which in most cases is double. The two uteri are connected by a band of connective tissue extending from their medial borders. Occasionally a peritoneal fold is found passing from the posterior surface of the bladder, between the two uteri, to the anterior surface of the rectum. This fold, the so-called vesicorectal ligament, is regarded by some as of embryonal origin and an etiological factor in the production of the malformation. One or both uteri may be infantile in character. Usually they are found in the normal anatomical position but may be displaced anteroposteriorly, or laterally.

*Fertility.*—From the clinical standpoint the greatest interest as well as importance, of uterus didelphys is its relation to pregnancy and labor. Thus the fertility and frequency of conception in women with this malformation is not particularly affected. In the 54 cases there were 34 married women, of which number 31, or 91.1 per cent, became pregnant. From these figures it is evident that women with this malformation conceive quite readily. One single woman in the group became pregnant, making in all 32 women who conceived. It is reasonable to assume, that were we dealing entirely with married women, in whom this malformation was uncomplicated, fertility would be even greater than normal because of the two uteri. Cases associated with atresia of the cervix or vagina, infantile uterus, infantile vagina or both, retention complications, etc., greatly lessen the chances for conception. This may be directly because of the peculiar anatomical structure and position or indirectly in causing dyspareunia or preventing coitus altogether. Earlier observers reached similar conclusions regarding fertility. Thus of the cases tabulated by Pfannenstiel in 1894, pregnancy occurred in 12, while 14 of the 15 married women in cases collected by Giles<sup>19</sup> became pregnant, or 92 per cent.

*Site of the Pregnancy.*—In the 32 women of this series who conceived there was a total of 67 pregnancies. In five of these women pregnancy occurred in the right uterus only. In nine it took place in the left uterus only. In seven it occurred in both uteri, while in 11 the side in which pregnancy took place was not mentioned. While pregnancy may occur in either or both sides, the deciding factor in uncomplicated cases appears to be the degree of development of the two uteri. This development may vary considerably and in many cases the uteri are so poorly developed, so infantile in character, that it is doubtful if pregnancy could ever occur. In cases associated with



double vagina, pregnancy is usually confined to the uterus connecting with the larger vagina, fertilization through the smaller vagina, especially when it is merely a tiny canal, being impossible. The size of the uterus on examination does not bear any direct relationship, nor is it a criterion, to the degree of development. In only three of the five cases where pregnancy occurred on the right side alone was the right uterus the larger previous to conception, and only four of the nine left-sided pregnancies revealed a larger left uterus previous to conception.

*Interruption of Pregnancy.*—This occurs far more frequently than in normal uterine pregnancy. Thus it is interesting to note that while the fertility and frequency of conception in these cases is not particularly affected, the chance for a normal spontaneous birth at term is only 41.7 per cent, occurring in 28 of the total 67 pregnancies. Abortion or interruption of pregnancy before the period of viability is the chief cause for this low percentage. Thus 19 of the 67 pregnancies aborted in the early months, or 28.3 per cent of all pregnancies occurring in women with this malformation abort in the early period of gestation. Giles found that 21.4 per cent of these cases abort, occurring in three of the thirteen cases reported by him. Bayard<sup>51</sup> reported fourteen abortions in 14 cases of double uteri. De Lee<sup>60</sup> places the abortion rate in general at approximately 24 per cent, which would make the rate in cases of uterus didelphys no higher than the general average. It must be remembered, however, that approximately 32 per cent<sup>60</sup> of all abortions occurring in women in general are self-induced, while in not one of the 32 pregnant women of this series was there a history of self-induced abortion. No doubt the malformation itself would in many cases lessen the ease of self-induced abortion. While it is impossible to state definitely the cause for this high rate of abortion, it is, nevertheless, of speculative interest to consider abnormal implantation of the ovum produced by the malformation, as well as the malformation itself. Malposition of the gravid horn must play an important rôle in interruption of pregnancy, just as the normally pregnant displaced uterus may terminate gestation. What bearing infantile development of the uterus would have on pregnancy is a question. Marked underdevelopment of the uterus would render it incompatible with pregnancy. No conclusions regarding the effect of retention complications upon fertility can be made, since in only one reported case with this complication did pregnancy occur.

Premature labor any time after the period of viability was the next most common cause for interruption of pregnancy before term. In seven of the 67 pregnancies birth took place prematurely or in 10.4 per cent of all pregnancies. One of these patients was delivered by

abdominal cesarean section, being unable to deliver by the natural route due to obstruction by the other nongravid half of the uterus.

The predisposing causes of premature labor are the same as those of abortion. Whether the enlarged nongravid half of the uterus could be considered an important etiological factor because of the congestion set up by its menstrual cycle is merely speculative. If the true cause of labor were clearly understood premature interruption of pregnancy in these cases could be more easily explained.

*Deliveries at Term.*—Of the 67 pregnancies, 41 or 61.1 per cent went to term. Yet only 28 of the 41 cases, or 68.2 per cent, were delivered normally. In other words only 41.7 per cent of all pregnancies occurring in women with this malformation have normal confinements. It is evident then, what may be expected of these cases during pregnancy and labor.

*Causes of Dystocia.*—The complicating factors in the abnormal deliveries at term were as follows in order of frequency: (1) enlarged nongravid half of the uterus; (2) vaginal septum in cases associated with a double vagina; (3) uterine inertia; (4) tetanically contracted uterus; (5) retention complications and (6) eclampsia. In three of the thirteen complicated deliveries at term or in 23 per cent of all cases complicated at term, the enlarged nongravid half of the uterus was the obstructing factor. In one premature delivery dystocia was due to this same cause. Thus four, or 5.9 per cent of all deliveries occurring in women with this malformation are obstructed by the other uterus. Obstruction from this source seems all the more plausible when we recall as mentioned by Handfield-Jones<sup>35</sup> that the nonpregnant half enlarges in sympathy with the gravid half during pregnancy, thus increasing its potentiality as a complicating factor. Obstruction to delivery from this source acts in two ways: First, because of its size, in preventing progress of the presenting part and second, because of its close anatomical relationship, in displacing the pregnant uterus from the direct axis of the parturient canal. Apparently where the pregnant horn is encroached upon by the nongravid half, this occurs either in the early months of pregnancy, causing incarceration due to enlargement and the peculiar anatomical situation of both uteri, or during labor when the process of delivery may be seriously impeded. While this malformation does not absolutely contraindicate version and extraction, it is nevertheless full of possibilities and it would be well to consider these in any case where this procedure is contemplated. Although 41.7 per cent of the pregnant women who have this malformation have normal spontaneous deliveries at term, it seems reasonable to believe, that many of these apparently normal labors are prolonged and tedious,—in some due to the obstructing other half and in others to the vaginal septum or both.

In two of the complicated term deliveries the vaginal septum was to blame. No doubt many unrecorded cases meet with obstruction to a greater or lesser degree from this same source. In most cases, this vaginal septum is obliterated after the first parturition. In one case mentioned by Wells,<sup>52</sup> however, the septum withstood seventeen labors.

Uterine inertia was the cause for interference in two cases. While this is one of the most frequent reasons for interference during labor in general, the probable occurrence is vastly greater in cases with the malformation under consideration. The vaginal septum and enlarged nongravid half of the uterus, both diagnosed and undiagnosed, are prominent in its production. The fact that many of these patients have genitalia of an infantile character would also aid in the production of inertia during labor.

In one case of tetanically contracted uterus, due to marked obstruction in delivery, cesarean section was necessary. More frequent occurrence of this complication might be expected since one factor at least is always present.

One case was complicated at term by eclamptic convulsions. This may have been of mere incidental occurrence and yet it seems reasonable to believe the existence of a predisposing factor in some cases, as for example the case reported, from our clinic, where one kidney was absent. The increased requirements thrown on the one available kidney in such cases might easily be an important factor in precipitating a nephritic toxemia of pregnancy. How frequently such relationships exist is a question; the possibility, however, remains.

*Complication Due to Atresia.*—This may prove a serious obstruction to delivery, as illustrated by Wendling's case (mentioned by Wells), where a dead child was extracted after incision of the vaginal wall and drainage of a large amount of retained fluid. Pregnancy, however, occurring in these cases must be very rare. Of the eleven cases of uterus didelphys associated with retention complications, pregnancy occurred in but one.

*Means Employed to Terminate Complicated Pregnancies.*—Of the cases necessitating interference, forceps were required in four, version and extraction in three, cesarean section in two and manual removal of the placenta in eight.

Thus four of the forty-one term deliveries, or 9.7 per cent of all cases going to term required forceps. Two of these were for inertia, one for aftercoming head in a version and extraction. The indication for the fourth case could not be determined. With the ever present potentially complicating factors it is natural to expect more frequent indications for forceps. This becomes evident when we realize that encroachment by the other nongravid half occurs most fre-

quently during labor. The infantile character of the genitalia again produces more frequent necessity for interference.

Version and extraction were performed in 7.3 per cent of all term cases. All three of the version cases, however, were further complicated. Thus one required forceps for the aftercoming head, another manual removal of the placenta and in the third case extraction was greatly prolonged and complicated by the other uterus. These cases where the complicating factor has already demonstrated its presence and power in obstructing normal delivery would seem poor risks for version and extraction.

Abdominal cesarean section was performed in two cases, in one because of a tetanically contracted uterus during labor at term, the other because of dystocia due to the enlarged second uterus. This operative procedure, however, is probably more frequent than would appear. Thus Scott<sup>53</sup> reported ten cases of rupture occurring in double uteri in varying degree. Forty per cent of the total number of cesarean sections in his report were for this complication. The possibility of rupture of the uterus must ever be borne in mind especially in the type of case mentioned by Wells, where pregnancy occurred in the rudimentary horn of the malformed uterus, the cervical portion of which was largely fibrous and incapable of carrying out properly the functions of a normal cervix during labor. Potocki<sup>46</sup> warns us of this danger, especially in cases of a second pregnancy occurring in uterus didelphys, where the first delivery was accomplished by cesarean section.

While abnormal presentations are more common in certain types of uterine malformations, such is not the case in uterus didelphys, except when pregnancy occurs in both uteri at the same time.

*Complications in the Third Stage and Puerperium.*—Not only are pregnancy and labor complicated in cases of uterus didelphys but also the third stage and the puerperium. Thus in the total 67 pregnancies, manual removal of the placenta was necessary in eight cases, or 11.9 per cent of all third stages were thus complicated. Three of these followed premature stillbirths, three followed abortion, one followed a version and extraction and one a forceps delivery. It is doubtful whether there is any special significance to be attached to the frequency of this complication. Retention of the secundines is not unusual in abortion in premature deliveries. In patients confined at term it is of infrequent occurrence. Where this occurs in cases of uterus didelphys it is probable that the malposition, and interference with the normal uterine contractions by the other half of the uterus are etiological factors.

The complications which uterus didelphys may produce does not cease with the third stage. Thus postpartum hemorrhage and subinvolution occur more frequently than in normal cases, the nonpreg-

nant half of the uterus acting like a full bladder in preventing normal postpartum contractions of the gravid uterus. Free drainage of the lochia might readily be prevented by the malposition of the uterus, due again to its obstructing companion. Postpartum retroversion also tends to occur more frequently.

Next in importance to obstetrical complications are the so-called retention complications. Thus hematometra was found in eight of the fifty-four cases, or in 14.8 per cent; on the right side in seven cases, while in one case the side involved was not mentioned. Pyometra was reported in only one case, occurring on the left side. These cases present an ever existing danger in that they may become infected and rupture through the fallopian tubes into the peritoneal cavity (as occurred in the cases of Williams<sup>55</sup> and Fordyce<sup>40</sup>) with the possibility of fatal peritonitis.

Double uterus occurs nearly always with double vagina. Of the total 54 cases 42 were associated with double vagina. Three cases had a single vagina and in nine cases the vagina was not mentioned. In eight of these cases there was an associated hematoocolpos, occurring on the right side in six cases and on the left side in two cases. This condition was found in 14.8 per cent of all cases reported. In one case pyocolpos was reported on the left side and associated with a pyometra of the same side. In patients with retention complications the average age at the time of diagnosis was considerably younger than where this condition did not exist. Far more rare but of great importance are the unusual complications which are occasionally associated with uterus didelphys. Cases associated with ectopia of the bladder,<sup>43</sup> double vulva, double urethra, double bladder,<sup>7</sup> fibroids<sup>32</sup> have been reported. The case presented in this article was associated with a pelvic kidney. The left kidney was absent while at the level of the last lumbar vertebra there was found a rudimentary and retroperitoneal kidney.

CASE REPORT.—Miss L., age fourteen, single, admitted to the University Hospital on August 4, 1920. The patient's family and personal history was unimportant up to the time of puberty. Menstruation began in January, 1920, eight months previous to the time of admission. Her periods had always been irregular, with intervals of one or two months, their duration being four to five days. During her period she complained of pain in the lower abdomen, this pain gradually subsiding at the cessation of the period. There was no history of menorrhagia or leucorrhea. Her chief complaint at the time of admission to the hospital was continuous pain in the lower left quadrant, more severe at the time of her periods. The present trouble began about June 14, 1920, with severe pain in the abdomen especially in the lower left quadrant. This was associated with some fever and general symptoms. There was no history of chills, nausea or vomiting. On June 21st, 1920 she was operated upon for appendicitis. Convalescence from the operation was normal. The pain in the abdomen, however, persisted and on August 4, 1920 she was admitted to the University Hospital.

Examination showed the patient to be of medium size and well nourished. The blood pressure was normal. Abdominal examination revealed marked tenderness over the lower portion of the abdomen, more especially on the left. A mass, exceedingly tender to palpation, could be felt extending four finger breadths above the pubis on the left side, passing inward and toward the right. Vaginal examination was not made because of the patient's age and the unruptured hymen. A bloody vaginal discharge, however, was noted. The examination was made at the time of the patient's menstrual period and the fact that she was apparently menstruating normally was largely responsible for the correct diagnosis not being made. Rectal examination revealed a tender mass, almost filling the left side of the pelvis and extending over to the right. Nothing definite aside from this fairly solid tumor mass could be made out. The patient was further examined by X-ray following inflation of the peritoneal cavity with carbon dioxid gas but as it turned out afterwards the plates were wrongly interpreted.

Provisional diagnoses of dermoid, solid tumor of the ovary, or pelvic kidney were made. The fact that the patient was apparently menstruating led to the belief that the uterus was not involved in the tumor mass, while the firmness suggested solid tumor of the ovary or possible pelvic kidney.

On August 10, 1920, the patient was operated upon and the true condition of uterus didelphys, left sided hematometra and hematocolpos, absence of the left kidney with a rudimentary retroperitoneal kidney situated at the level of the last lumbar vertebra, found. Upon opening the abdomen, what was apparently the uterus was seen well up toward the abdominal wall, overriding the mass below. The left tube was noted, leading off from the above mentioned uterus, and closely attached to the ovary, which was enlarged to the size of a small hen's egg, and lay markedly contorted posterior to the uterus above the large mass in the pelvis. The right kidney was definitely enlarged and in normal position. The left kidney was absent. The left tube and ovary were freed from adhesions, and the mass beneath further investigated. An attempt was made to aspirate the pelvic mass but nothing was obtained. The absence of the left kidney and the presence of the mass in the pelvis plus numerous adhesions made the diagnosis questionable for the time being. An incision was made in the anterior surface of the tumor and a large amount of old thick dark blood escaped. Further dissection revealed the true pathology. The small right uterus, with its tube and ovary, was found. It communicated with a tiny vaginal canal, and it was from this source the confusing menstrual flow had come. The enlarged left uterus with its bloody content, communicated with a left sided hematocolpos. Because of the damage which had been done in freeing adhesions and determining the nature of the condition it was necessary to remove all the pelvic organs. It was during this procedure that the rudimentary, retroperitoneal kidney was found. It was connected to the bladder by a dense band of fibrous tissue apparently the rudimentary ureter.

The patient made a slow but uneventful recovery and was discharged from the hospital three and one half weeks later.

*Diagnosis of This Condition.*—This in many cases is not made until after an exploratory laparotomy, or the abdomen is opened for some other reason. Unless there is a definite history of severe menstrual disturbance, delayed onset of menstruation or semimonthly show of blood, little value can be placed on the history from that point of

view. Dysmenorrhea is suggestive and in considering the cause, this type of malformation should never be forgotten. Painful menstruation occurred in 11 of the 54 cases, or in 20.3 per cent. Four of these cases had both hematometra and hematocolpos, while in one case hematometra alone existed. The other six cases were attended by no retention complication whatsoever. History of abdominal pain is of little diagnostic value since it occurs so frequently in other conditions. Abdominal pain, however, occurring in a case of uterus didelphys is always suggestive of an associated retention complication. Menorrhagia is apparently incidental. In Giles' series two patients complained of dysparunia and Ricketts<sup>57</sup> mentions that the urethra is frequently used for coitus in cases where the vagina is impractical. Amenorrhea is rare except in cases with retention of the menstrual flow. In these the diagnosis is frequently made early, the symptoms being of sufficient severity to demand early and careful examination. Thus in the cases with retention complications the diagnosis was made on the average of two and one-half years after the onset of menstruation. In cases where no retention existed the average age at the time of diagnosis was 27 or an average of 11 years after the onset of menstruation. The average age at the onset of menstruation was fifteen. In one case it began at twenty-six years and in several it was absent. Vaginal examination should always be made, under anesthesia, if necessary, when this condition is suspected. Rectal examination is not infrequently of great value. Any malformation of the external genitalia should lead to suspicion and if associated with an undiagnosed mass in the pelvis careful exploration of the uterus with a sound should be instituted. Holbans'<sup>58</sup> sign, the palpation of the so-called vesicorectal ligament, extending from the bladder to the rectum between the two uteri, has been found in some cases. In differentiating the mass from ectopic pregnancy, Williams<sup>61</sup> reminds us of the fact that the round ligament comes off the proximal side of the tumor in ectopic gestation while in uterus didelphys it comes off the lateral or distal portion. Pfannenstiel concluded that the pelves of women with this malformation were slightly enlarged, an interesting fact, but of little diagnostic value. The absence of the other abnormalities means nothing while their presence should always suggest the possibility of uterus didelphys. In the case reported by G. G. Ward, Jr.,<sup>62</sup> there were found besides the malformed uterus, stigmata of degeneration, short phalanges of the hands and feet, chondrodystrophic changes in the long bones as revealed by radiography. Two cases, one reported by Gemmell and Paterson<sup>59</sup> and one by Von Engel<sup>7</sup> showed double vulva, vagina, urethra and bladder.

The treatment of these cases will naturally vary considerably. Surgical interference except in cases associated with retention com-

plications, is rarely called for. In cases of hematomocolpos, incision and free drainage of the occluded vagina is sufficient. For hematometra, hysterectomy may be indicated. Cases presenting no definite indication for interference and having no symptoms should be let alone and all treatment limited to prevention of abortion, guarding against incarceration in the early months of pregnancy and in being prepared for interference during labor. The progress and course of labor as well as the early puerperium should be closely watched.

## CONCLUSIONS

1. Uterus didelphys is of more frequent occurrence than is generally believed. 2. Its greatest clinical importance lies in its relation to pregnancy and labor. 3. Only 41.7 per cent of women with this complication have normal spontaneous deliveries at term. 4. Forty per cent have complicated deliveries at term. 5. Abortion and premature labor occur frequently. 6. Most cases are associated with a double vagina. 7. Retention complications exist in 17 per cent of all cases. 8. Treatment should be conservative whenever possible.

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## DEGENERATION OF CONSERVED OVARIES AFTER HYSTERECTOMY IN RAT; AN EXPERIMENTAL STUDY\*

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GYNECOLOGIC surgeons are not yet in accord on the question of conservation of sound ovaries in hysterectomy. In operations for malignant neoplasms or where the ovaries are diseased, there is complete unanimity of opinion that both ovaries should be removed with the uterus; but as regards those cases in which, to all intents and purposes, the ovaries are healthy, gynecologists are still divided.

There have recently appeared the results of a follow-up study by Hawkes<sup>1</sup> in a series of cases in which hysterectomies had been performed, some with conservation of one or both ovaries, and others with removal of both ovaries. The author found that in 20 per cent of his cases there had occurred during the first three months after operation either an enlargement of the retained ovary or distinct pain at the site of its retention. These conditions were temporary in all cases except two. One patient developed an ovarian cyst about 15 cm. in diameter. In a second case the retained ovaries became cystic and adherent. The author concludes that healthy ovaries should be conserved because (1) the onset of vasomotor disturbances is delayed and their severity diminished when one or both ovaries are retained; and (2) very little serious harm is caused by a retained ovary.

Polak<sup>2</sup> studied a series of 300 cases in which hysterectomy had been done with conservation of the ovaries. These patients were followed for five years, and during this time it was found necessary to perform a secondary operation upon 73 (24 per cent) for cystic changes, cirrhosis, adhesions, and infections of the retained ovary. In his conclusions, Polak states that the average period of life of the retained ovary is two years and that the retained ovary is always a focus for possible trouble.

\*The experimental work here reported was done in the laboratories of the Institute of Cancer Research, Columbia University.

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Graves,<sup>3</sup> in a careful and thorough study of this problem, concludes that after extirpation of the uterus, vasomotor disturbances ensue with approximately equal frequency whether the ovaries be retained *in situ*, totally ablated, or transplanted, and that retention of ovarian tissues after hysterectomy is of little or no value and may be productive of serious harm to the patient. On frequent occasions he has found it necessary to remove ovaries that had been left in at previous operations, and in every instance, they were cystic, degenerated, and adherent. Paradoxical as it may seem, he has had several cases in which retention of ovaries was followed by severe menopause symptoms that were made to disappear completely after a secondary operation in which the ovaries were ablated. This he explains on the assumption that any break in the utero-ovarian function creates a disharmony evidenced by the so-called vasomotor disturbances, etc., and brought on as a reactive disturbance in the internal secretory apparatus. Extirpation of the ovaries removes the source of irritation and the glandular system resumes its normal balance. He cites several cases, the clinical courses of which logically bear out his statements and apparently prove his theory.

Both Walthard<sup>4</sup> and Schickele<sup>5</sup> found that the menopause symptoms occur in approximately 50 per cent of all their cases of hysterectomy irrespective of retention or ablation of the ovaries. These figures correspond with those of Graves. Dickinson,<sup>6</sup> on the other hand, in a thorough follow-up study of his cases found that when one or both ovaries were retained, there was complete freedom from symptoms in over 80 per cent of his patients. These findings are especially remarkable in view of the fact that in the normal natural menopause about 50 per cent of all women develop the usual symptoms. Vineberg<sup>7</sup> has found it necessary on several occasions to do a secondary operation for adherent cystic ovaries, and, therefore, advocates total ablation in all cases of hysterectomy. Grad<sup>8</sup> has on three occasions found it necessary to perform a secondary operation for the removal of the degenerated and cystic ovaries which at the time of the original operation were perfectly normal. Tuffier<sup>9</sup> maintains that ovaries are of no use without the uterus. Clarke and Norris<sup>14</sup> in a very recent publication conclude that "Better end results and greater comfort to the patient can be secured as the result of ovarian conservation" and that "conserved ovaries seldom give subsequent trouble."

In an attempt to throw some light on this question, the author decided to approach it from the experimental side. In view of the fact that practically all operators—Dickinson,<sup>6</sup> Polak,<sup>2</sup> Sampson,<sup>10</sup> etc.,—found that when the ovary with its corresponding tube is retained disturbances are less likely to occur, it appeared to the writer that besides the factor of vascular disturbances, the influence of a

possible secretion from the tube might come into play. In order to study this possible factor, the experiments were arranged accordingly.

As a result of a number of dissections in the rat, the blood supply of the internal genitalia was determined to be as follows: The uterine artery is directed toward the lower part of the uterus and divides into an ascending large branch and a descending small one. The former runs parallel with the uterus in the mesosalpinx and near the termination of that organ anastomoses with a branch of the ovarian. The latter arises either from the renal artery or directly from the abdominal aorta, runs outward toward the ovary and when about 1 cm. from this organ divides into three to five branches. Those cephalad go directly to the ovary and one or two caudad anastomose with the uterine. From the diagrammatic sketch, it can be seen that whenever the uterus is removed *in toto* it practically always follows that the ovarian circulation is distinctly interfered with.

In a comprehensive study of the blood supply of the ovary, uterus, and tube in the human subject, Sampson<sup>10</sup> showed the close interrelationship that obtains, and the ease with which the ovarian circulation can be interfered with, especially when the tubes are removed. In a similar study of blood-vessel injection experiments, Keitler<sup>11</sup> came to the conclusion that it is practically impossible to avoid injuring the ovarian branch of the uterine artery during the performance of a hysterectomy. He also showed that in the rabbit the blood supply of the ovaries is quite independent of that of the uterus, and that in these animals a carefully performed hysterectomy is not followed by ovarian atrophy. It seems to the writer that Mandl and Buerger,<sup>12</sup> Burkhardt,<sup>13</sup> and the other investigators who found ovarian atrophy after hysterectomy in the rabbit after a period of eight months to three years were dealing with senile physiological changes rather than with artificial ones produced by surgical interference.

In this study young but sexually mature female rats were employed. In one series, 5 in number, when the hysterectomy was performed the uterine blood vessels were deliberately cut through at both the distal and the proximal ends. In a second series, 6 in number, the hysterectomy was performed so as not in any way to injure the blood supply of the uterus or of the ovaries. In a third and fourth series, the same procedures were followed as in the first two groups, only a hemihysterectomy, however, being done. The animals were killed at intervals of 10 days to 11 weeks. In these four series, both ovaries were removed at the time the animal was killed. As a further means of control, a fifth series was employed where complete hysterectomy was done with all precautions not to injure the blood supply. Here, however, one ovary was removed at the time of operation and the other when the animal was killed.

The results based on a microscopical serial section study of the ovaries showed the following: In the first series, in which the hysterectomy was performed with total disregard of the blood supply, the retained ovaries presented distinct signs of degeneration. The intensity of these degenerative changes varied directly with the interval of time between the operation and the death of the animal. This is in complete accord with clinical experience and is due to the absence of the formation to a collateral circulation. In the second series, in which the attempt was made to preserve the blood supply, the same degenerative changes were found in the ovaries as were noted in the first series, in which no attempt was made in this direction. Here, too, the degenerative changes were more marked as the post-operative interval lengthened. When half of the uterus was removed and the blood vessels deliberately severed, the ovary on the non-operated side was normal, that on the side where the hemihysterectomy was performed, was degenerated. Here, again, the intensity of the degenerative changes increased with the time interval after operation. In the series in which hemihysterectomy was done and precautions were employed not to injure the blood supply, the ovaries on the operated side, except in two instances, showed degenerative changes. These two cases may be explained on the ground that possibly the ovarian arteries in these animals sent their largest branches directly to the ovaries, thus practically insuring this organ a normal blood supply. It could not have been due to any secretory influence from a possible secretion from the other half of the uterus because, if this were the case, in all the other operations where half of the uterus was preserved the ovary on the excised side would have had the same normal structure as on the nonoperated side.

The degenerative changes can be thus briefly summarized. In the early cases only the ovum was abnormal. The outline of this body lost its regular circular form and became scalloped or irregularly ovoid. The cytoplasm appeared mottled and irregularly granular. In some instances the nucleus was pycnotic, in others it was completely missing. In practically all cases the nucleolus was not seen. In the later changes, it was noted that the granulosa cells of the graafian follicles stained rather poorly, especially the cells toward the center. Frequently, while the outer cells were apparently quite normal, those in the center had lost all their staining characteristics. The regularity of their arrangement began to disappear first in the center and then progressively toward the periphery. The zone of granuloma cells diminished in size until in the later stages all that remained were well defined cysts with one or two layers of granulosa cells. In these cases the ovary presented the appearance of a multiple microcystic body. The granulosa cells in addition to these changes, also became

in places pycnotic and its protoplasm presented marked degrees of karyorrhexis and of karyolysis. The follicular space, in the advanced specimens, contained large desquamated granulosa cells that had no resemblance at all to the original ones. Occasionally a few neutrophilic leucocytes were seen in some of the follicles. In no case was any exudative or inflammatory reaction seen. Macroscopically, no adhesions were encountered between the ovaries and any of the adjacent tissues or organs. The changes were purely retrogressive, degenerative ones.

### CONCLUSIONS

In consideration of the numerous clinical evidences of degeneration, especially cystic, and in view of the evidences of degeneration that were almost invariably found in the ovaries of the animals studied in these experiments, it seems that one may justly conclude:

1. That conservation of sound ovaries where the uterus is removed is of no avail in preventing distressing menopause symptoms.
2. That the dangers of cystic and other degenerative changes are so great that the retention of the ovaries constitutes a serious danger.
3. That it is safer to remove the ovaries in all cases where a hysterectomy is performed.

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20 WEST FIFTIETH STREET.

(For discussion, see p. 434.)

# THE INFLUENCE OF THE PLACENTA ON THE MAMMARY GLAND

By C. M. STIMSON, M.D., PHILADELPHIA, PA.

IN the process of lactation two interesting phases present themselves for consideration: first, the physiologic hypertrophy which the mammary gland undergoes during pregnancy, beginning soon after the implantation of the impregnated ovum and lasting until the termination of pregnancy, and, second, that represented by the actual appearance of the milk. It is with the latter that this communication has to deal.

Whatever may be the cause of the physiologic hypertrophy, whether ferments or hormones of fetal or ovarian origin circulating in the maternal blood, activating the gland to take on increased size preparatory to supplying nutrition for the child, it is certain that something holds in check the actual appearance of the milk until it is needed, else why would not a pregnant woman with large engorged mammae begin lactating in the latter months of pregnancy when the gland has attained its full size? There is evidently some automatic inhibitor exerting its influence during pregnancy, controlling the appearance of milk until the third day, usually, after the birth of the child or the termination of pregnancy in miscarriage. I believe this inhibitor to be the placenta, and have clinical evidence which strongly suggests this view.

For several years I have observed that in cases of incomplete abortion, or miscarriage, near or after the fifth month, milk does not usually appear in the breasts until after the detachment of all the placental tissue. Not all cases of incomplete abortion, however, lend themselves to this observation as in early abortion there may be little, if any, breast disturbance. In miscarriage after the age of viability, where there is adherent retained placenta, that is, where a considerable quantity of placental tissue retains its attachment to the uterine wall, it will be observed that lactation is usually held in abeyance until this tissue separates. I have observed this in many cases and hence almost conclude that when milk appears in the breasts no placental tissue, or at least not enough to furnish an inhibitor, remains attached in the uterus. Simple detached retained placenta acts, I believe, as a foreign body and has little if any influence on the mammary gland.

My attention was called to this matter about ten years ago by the following case:

Mrs. B., para, viii, thirty-six years of age, gave birth to a full term normal child after a normal labor. Much to her surprise, for she had nursed all her children, no milk appeared in her breasts up to the tenth day, the time she was discharged, and the baby was put on the bottle. Three days later I was called in a hurry and found that after a few pains the patient had expelled a mass about the size of a lemon, accompanied by a little bleeding. Upon examination the mass was found to be placental tissue which showed no evidence of degeneration and appeared to be freshly detached. This was thirteen days after the birth of her child. Three days later, to my surprise, I found her nursing her baby, milk having appeared that day. She continued nursing the child until the regular weaning time.

I intended waiting until I had other similar cases to report but thus far, after having had a considerable number of maternity cases, have not been fortunate enough to run across another similar case, and am reporting this in the hope that others may, perhaps, confirm my observation.

It would appear that during pregnancy there is something in the maternal blood that inhibits the actual process of lactation; that when this substance is removed (eliminated) lactation occurs; that in the case above cited lactation did not occur during the presence of attached placental tissue within the uterine cavity; that in certain cases of abortion milk does not appear in the breasts while placental tissue remains attached in the uterus. The thought, therefore, suggests itself that the placenta furnished the inhibitor to the mammary gland, holding it in check until there is a demand for its functioning. Conclusions cannot be based, however, on one case or on several cases, and it is to be hoped that other clinical observations will be made to check up these findings.

167 HARVEY STREET.

# Society Transactions

## AMERICAN GYNECOLOGICAL SOCIETY

### FORTY-SEVENTH ANNUAL MEETING

WASHINGTON, D. C., MAY 1, 2, 3, 1922

(Continued from September issue.)

DR. EDWARD P. DAVIS, of Philadelphia, Pa., read a paper entitled **The Uterus After Cesarean Section.** (For original article see p. 335.)

#### DISCUSSION

DR. WILLIAM E. STUDDIFORD, NEW YORK CITY.—I would like to take up the question of the cesarean section scar and what it will stand in the presence of a second pregnancy. Of course, if we have an absolute indication, a second cesarean section is always indicated, but in these days, when cesarean section is done for many other conditions, when it is possible for a woman to have a child by normal labor, the question of the strength of the cesarean scar is important. I notice in Dr. Davis' abstract he has given first place to the question of suture of the uterus, next the question of sepsis as an indication of the strength of the scar. I believe there is one other element that should be added of which little note is made in the literature, and that is the question of the location of the incision in the uterus.

As you look over the literature of cesarean scars and ruptures, you will find in many cases where rupture has occurred it has been through a fundal scar. This was one reason for the giving up of the transverse incision.

In the past five or six years I have seen three cases of rupture following cesarean section, and in every one of these the incision was either made at the fundus or away from the median line, usually an oblique incision extending through the left horn of the uterus down through the middle of the uterus, probably because the operation was rapidly done, and no attempt made to rectify the rotation of the uterus to the right. I also think one reason for the failure to obtain a firm cesarean scar in the uterus, especially in cases performed after prolonged labor, is due to the marked thickening of the fundal muscle; that is, as the uterus retracts the fundus becomes very much thickened, and if there is no advance of the child, there is a thinning out of the lower and intermediate segments. Usually the uterus in that case is drawn forward, so that if the high incision is made in the abdomen, the incision in the uterus is apt to be made posterior to the fundus. If such a uterus is sutured after the child is born, the uterine muscle is drawn together and sutured when it is in tense retraction, with thinned out lower and intermediate segments, with the result that as the uterus undergoes involution and the muscle readjusts itself, the sutures in the thickened portion of the muscle begin to loosen up. This produces a separation of the edges of incision, especially of its inner portion, while the peritoneal edges of the incision unite promptly, not being under so much strain. Many of the bad results found on secondary operation are probably due to the relaxation of the sutures occurring in thick retracted muscle shortly after operation.

The same thing applies to the use of pituitrin at the time of the cesarean opera-



tion. If you give pituitrin before the uterus is opened, you will find that you get marked contraction of the uterus, and by the time the sutures are in place and tied, the uterus begins to relax, with the result you have some loosening of the suture line along the course of the incision. I have had a chance to test this out several times this winter, withholding pituitrin until the uterus was sutured. Soon after injection was made a tremendous tension could be observed along the course of the scar. The reverse of this holds equally well if you suture the uterus while the pituitrin is active. As the effect diminishes, the suture line relaxes, and there is a possibility of having hemorrhage between the sutured surfaces resulting in a badly healed uterine scar. I think many of these cases we have called sepsis are really due to a separation of the scar on the interior of the uterus caused by such conditions of the uterine mucosa. The external layer of muscles and peritoneum is brought together, as a rule, by a special line of suture, and we know the peritoneum heals rapidly, with the result you get healing of the external surface and a separation of the muscles on the interior of the uterus.

I believe that Sanger was right in his location of the incision in the uterus in the midline, in the intermediate segment of the uterus, and should not extend into the fundus or into the cervix, and if the incision is made at that point the bleeding is usually reduced to the minimum, as Dr. Sampson's pictures of injection of the uterine circulation show an anemic area in the midline. There will be very little bleeding even when the placenta presents at the site of the incision. If the suture is made as the uterine muscle retracts, there will be tightening of the sutures and not relaxation with arrest of hemorrhage and separation of the muscle layers.

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MARYLAND.—I must confess I could not follow all of Dr. Davis' conclusions. I think that is partly due to the fact that some of his sections were so thick that they obscured all detail of structure, so I shall not discuss that phase of the paper except as it applies to the last case. As I understood it, Dr. Davis stated that the placenta showed histologic evidence of the existence of toxemia. From my experience I should not say that it does, as I am not acquainted with any characteristic placental lesions in this condition. Furthermore, I would say that the lesions described by him were such as may occur in any placenta and are not necessarily associated with toxemia.

The matter of the cesarean scar is one in which I have been much interested for a number of years.

Within the past few months Dr. Thomas O. Gamble, of Albany, and who was formerly on my staff, published all of our material, comprising 23 uteri which had been removed at the second or third cesarean section, and his findings were similar to those of Dr. Studdiford. In the majority of cases of rupture the accident is due to an imperfect scar, and in many cases one can get a clear history of infection following the original section. There is no doubt that the secret of preventing rupture lies in suturing the uterine incision correctly, and I agree with Dr. Studdiford that the higher up you go the greater danger there is for the woman. I make my incision below the umbilicus, and suture the uterus in two layers. The first, which consists of interrupted sutures, takes in the greater part of the uterine muscle, but does not come to the peritoneal surface. After the knots are tied and cut, they are buried by means of a continuous suture which brings together the superficial layer of muscle and the peritoneum. Our results have been very satisfactory indeed, as we have had only a single rupture in over fifty pregnancies following previous sections, and that occurred in a woman who was profoundly infected at the first section.

Apparently the bleeding is no greater when the placenta is inserted anteriorly, and the results in subsequent pregnancies are equally good.

DR. RUDOLPH W. HOLMES, CHICAGO, ILLINOIS.—Many years ago a member of our Society reiterated the assertion that the danger of rupture entirely depended upon the man who made the suture primarily. I did a section on a woman who later had a spontaneous labor. About a year after this easy labor she was brought to the hospital moribund. She died before operation. She was at term, in labor, with a rupture which occurred in the tissues directly contiguous to the scar, the latter being trabeculated. I believe, even a mild infection may be responsible for such an accident, but, catgut which has not been adequately hardened may be equally responsible; also, stitches which are tied too tightly may cause an anemia of the tissues which degenerates them, and may be the cause of the rupture just beyond the scar. I have done 11 repeated sections, and one was a repeated section on a woman done elsewhere. There were 24 children born by sections, namely, two had three sections. All had perfect scars. In one there was no vestige of the old scar. In another it was hardly visible. The rest had a roughening of the peritoneum which determined the location of the old incision. In all the integrity of the entire thickness of muscle was perfect. I have been given to understand that one of my patients was later delivered by forceps, and the uterine cavity palpated, which showed the presence of a crease on the mucous surface.

Rupture, I believe, is due to an infection, mild though it may be, during the cesarean convalescence. Secondly, an important item is that the stitches shall not be too tightly tied. Thirdly, the catgut should be 20-40 day chromic gut, otherwise absorption will be too rapid. Finally, the sutures should be so applied that there are no dead spaces. It is a mistake to employ continuous sutures, for the suture will loosen during the time of retraction of the uterus.

DR. DAVIS (closing).—I fully agree with Dr. Studdiford concerning the high incision. I did not take up the incision through the lower uterine segment, because, so far as I know, we have not as yet sufficient data to determine the frequency of rupture. I have operated on cases that had been operated on by incision through the lower uterine segment. In two cases there were many and dense adhesions existing between the contiguous tissues and the uterus.

It is interesting to note that one operator recommends making a transverse incision across the lower segment; and the two flap operation is the most recent effort to avoid rupture of the scar and to limit the spread of infection.

There is no question that the incision in the uterus should be, as Dr. Studdiford has said, in the center and never near the fundus. I prefer to examine the entire uterus carefully before making an incision and I extend the incision with reference to the contour of the uterus, always avoiding the upper portion. In suturing the cesarean uterus we should wait for retraction, and not suture the uterus during the initial and very active period of contraction of the uterine muscle. That I think is a very important thing to remember.

Whether we shall have no ruptures if we continue to operate through the lower segment by the extraperitoneal operation or not, we do not know as yet, and Säger was right in selecting the incision neither above nor below but through the middle of the uterus.

As regards Dr. Holmes' remarks concerning the use of catgut, the percentage of ruptures after the use of catgut is decidedly higher than by any other suture material.

The slides I have exhibited showed the character of the changes in the uterine muscle very distinctly in cases where complete recovery, with subsequent spontaneous labor had followed cesarean section; and also degenerative changes in the muscle which led to rupture.

DR. ALFRED B. SPALDING, of San Francisco, Calif., read a paper entitled **The Extent of Renal Lesions in the Toxemias of Pregnancy.** (For original article see p. 350.)

#### DISCUSSION

DR. JENNINGS C. LITZENBERG, MINNEAPOLIS, MINNESOTA.—I have been very much interested in Dr. Spalding's paper because we are carrying on similar investigations in the University of Minnesota at the present time with another renal test, but as yet are unable to give the final conclusions.

We have all been disappointed to find women with toxemia whom we have delivered, as we thought, at the proper time in order to save their kidneys, and yet those women are left with permanently damaged organs. I have thought for some time, with the rest of you no doubt, that it is not our sole duty to deliver a woman alive and put into her arms a living baby, but that it is our duty as well to restore her to her family and to the community in complete health. We see many cases that we thought we had given the best of care whose kidneys did not clear up, and who did not have a chronic kidney condition before delivery. Therefore, with this object in view, we have been carrying on our studies, but we have not gone as far as Dr. Spalding has.

I am impressed with his paper from two standpoints, one of which is his careful work, and the splendid cooperative work with the biochemist. His method, I believe, was developed by Dr. Addis. The method we use was developed by Professor Kingsbury, a professor of biochemistry in the University of Minnesota. The first reports on the test were made by Kingsbury and Swansen in the *Journal of Biochemistry* of last year. His test, like the one used by Dr. Spalding, is a real physiological test, and not simply a test of permeability of the kidney acting as a strain for dye. The urea in the urine is produced by the physiological biochemical processes of the body; therefore, it is a good test, because it is a true test of physiological function. As Dr. Kingsbury has pointed out, the test consists of giving sodium benzoate which is excreted as hippuric acid, and is recovered in the urine. In normal cases there is 80, 90 and even 100 per cent of a return of the sodium benzoate in the form of hippuric acid.

Kingsbury and Swansen in their work have apparently established the fact that this test detects earlier than phenolsulphonephthalein any reduction of kidney function and, also, that it is more constant. When the value of all these kidney tests is worked out, along with the test Dr. Spalding has given, perhaps we will be able to tell a little more accurately when the kidney is being damaged to an extent that renders it dangerous to permit pregnancy to continue. If we can add anything that will make our judgment more accurate so that we can say in this or that case it is dangerous to let this woman go further because she is apt to have a permanently damaged kidney, it will be a great advance. If this test Dr. Spalding is working out, or the Kingsbury test, or the phthalein test taken together can tell us something which will enable us to judge more accurately how much the kidney has been damaged, or is in danger of being permanently damaged, all of the work done by the biochemists and the painstaking work of Dr. Spalding in these cases will certainly be worth while, and it will have the additional value, which Dr. Spalding has emphasized, namely, the method of following these cases after delivery until the kidney has been restored to normal.

This work of Dr. Spalding's should be carried out to its conclusion, because if we can get a real renal functional test which will help us to more accurately estimate when the kidney has been damaged to the point that it is unsafe to let the woman go further, we will have progressed very far in caring for our toxic cases.

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MARYLAND.—We know little or nothing about toxemia and eclampsia. I know less today than I thought I knew twenty-five years ago. What we are going to get from the tests described I cannot tell.

During the last few years we have been getting back for examination a year after labor all patients delivered in the service, and at that time we have found that all patients who had frank eclampsia were, without exception, normal in every respect as regards urine, blood pressure, eye grounds, and everything else. On the other hand, in a considerable proportion of the women, who did not have eclampsia, but whose condition was diagnosticated as preeclamptic toxemia, we have found chronic nephritis at the end of the year.

What do such facts mean? We ordinarily regard preeclamptic toxemia as a forerunner of eclampsia, and consider the latter as the acme of the toxemia. But at the end of the year we find the eclamptic women are all right, while those who suffered from what we considered its forerunner or precursor are all wrong. Consequently it looks as if we may be dealing with two quite different conditions. Whether I am correct or not, time can only show. We have studied about 100 of these patients, but I cannot give you the exact figures at this time, but does it mean that so-called preeclamptic toxemia has no connection with eclampsia, and that the former really represents a renal lesion which may eventuate in chronic nephritis, while the latter is a true toxemia?

Dr. Spalding's figures may give us some information along such lines. In many of his patients the urea output was well below normal, but, of course, only two of them had been followed sufficiently long after delivery, and they do not prove anything along the line I have indicated. I have an idea that when we get through with our studies that we shall find that preeclamptic toxemia, if let alone, might cause death, but would never eventuate in eclampsia.

DR. ARTHUR H. MORSE, NEW HAVEN, CONNECTICUT.—The method upon which Dr. Spalding's test is based was suggested by Addis and Watanbee. These investigators found that in the case of urea there was a loose relation between the rate of excretion and the concentration in the blood, namely, the higher the level of concentration of urea in the blood, the greater in general was the rate of urea excretion in the urine. They had noted also in other empirical observations on the effect on kidney function of removal of part of the kidney tissue, that the anatomical defect had a notable influence upon the function only if the remaining renal structure was subjected to a demand for increased activity in urea excretion by the administration of preformed urea. In 1918, they sought to approximate more closely the conditions which obtain in disease by a comparison of the degree of anatomical defect resulting from action of uranium acetate on the kidney, and the degree to which the function of urea excretion was disturbed under conditions involving strain on the damaged kidney. They made use of uranium acetate because it produces easily demonstrable lesions varying, according to the amount administered and the susceptibility of the animal, from necrosis to fatty and granular degeneration and because, except in large doses, it appreciably injures only the proximal convoluted tubule. Since urea is found in relatively large amounts in the cells of the convoluted tubule and as the quantity of urea is increased here during urea excretion, it appears that the cells of the tubes have a great deal to do with the concentration of urea from the blood. Therefore the lesions of the kidney which were produced by the administration of uranium acetate occurred in the parts essential in the excretion of urea. By varying the amounts of uranium administered, they were able to produce severe, mild and slight anatomical lesions. They then attempted to correlate the pathological changes in the renal structure with the

changes in urea excretion. This was done by giving uranium acetate in order to produce lesions in the convoluted tubules and then by giving preformed urea by mouth and determining the ratio between the urea concentration in the blood and the urea content of the urine. It was found that the classification made according to the ratio between the urea content of the urine and of the blood disagreed with the anatomical classification in only two instances.

Dr. Spalding's paper takes up the question from a clinical standpoint. He has determined the excretion of urea in normal nonpregnant individuals during pregnancy, in women following delivery, and finally in women who have had toxemia, and has brought out the fact that in the latter the output of urea is decreased.

Now, if we accept the work of Addis and regard the cells of the convoluted tubules as the cells particularly concerned in the excretion of urea and, if we determine that subject to a toxemia the output of urea is decreased we are led to the conclusion advanced by Dr. Spalding that in these patients there is a permanent damage to the cells of the convoluted tubules. Of course, it is important that all these patients be followed carefully over a period of years.

The point mentioned by Dr. Litzenberg is of importance. The attitude of the biochemist frequently differs from that of the clinician. All these biochemical problems need for their solution the cooperation of the biochemist and the clinician. In other words, such investigations are so complex as to demand the individuality, the skill and the experience of several specialists.

DR. SPALDING (closing).—I would like to emphasize a point brought out by Dr. Litzenberg, namely, the value of working with the various departments, particularly with the medical department. By cooperation, we as obstetricians can help clinically to determine what the damage to the kidney is in the various toxemias of pregnancy.

With the test of Dr. Addis we have a method of measuring quantitatively the damage that exists in the kidney. We have records of some cases studied for more than two years which were not included in the charts of his paper, because they had chronic nephritis. The function in these cases has gone down from 60 to 55, and finally to 5 before they developed uremia. In one case we have the kidneys obtained at autopsy.

Dr. Williams remarks on the differences they found in the tests in the cases of eclampsia and in the preeclamptic toxemias. To me, that does not seem hard to explain because in the case of eclampsia, the toxin is not poisoning the kidney so much as some other part of the body, and the extrarenal damage produces the convulsions of eclampsia. In the preeclamptic toxemia, the toxin acts longer on the kidneys and does not always produce subjective symptoms.

We have not as yet studied patients who have become pregnant while suffering with chronic nephritis.

A study of 100 puerperal patients will cost a considerable amount of money, as fully one-half the material is lost because of the poor training of the nurse. She does not know quantitative methods. She is taught to report facts only approximately correct as to time, while in these tests the facts must be accurate. This loose teaching is wrong. Every patient is submitted to three tests and by averaging these three tests we can tell if something has gone wrong with the test of a patient. The patient must take from 750 c.c. to 1000 c.c. of water with 30 grams of urea in it. If the patient should vomit, it will disturb the test. Sometimes a nurse will give food to a patient because she gets hungry. The patient cannot have anything to eat from 6 o'clock one evening until noon time the next day. It is always a surprise to see how easily such an error committed in the ward is detected by the technician in the laboratory. The laboratory men have far more accurate ways of

determining deductions than we clinicians have in helping them to carry out intelligent tests.

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DR. FRANK W. LYNCH, of San Francisco, Calif., read a paper entitled **Retroversions of the Uterus. A Statistical Study Based upon Fifteen Hundred Postpartum Records of the Woman's Clinic of University of California Hospital.** (For original article see p. 362.)

#### DISCUSSION

DR. CHANNING W. BARRETT, CHICAGO, ILLINOIS.—The paper has been most interesting and it has verified some of the things we have had definitely in mind and have furnished a few surprises. We are all glad to have this statistical showing to counter the statistics of Winter which have been so frequently quoted by those who claim that retrodisplacements of the uterus gave no symptoms. Winter shows in his statistics that only 12 per cent had retrodisplacements of the uterus. Of 36 cases out of 200, very few of those had symptoms, and of those that had symptoms all but four could be credited to something else besides the displacement. These statistics have been quoted by men who set aside the idea that retrodisplacement could cause symptoms. Now, we have statistics showing about 41 per cent in clinic and private patients have displacements, and that quite a large percentage of these show symptoms due to the displacement which can be relieved by correcting the displacement.

The fact that these displacements are so common after confinement and the further fact that they can be corrected much more easily, if treated early, should lead us to consider the factors in regard to supporting it. The factors in regard to the cause of the displacement after confinement should deal with the patients, so that fewer than 41 per cent would have displacement, if possible. The very conditions that exist after confinement favor displacement, that is, a heavy organ, ligaments that have not involuted, as well as pelvic tissues that have not involuted, so that when a patient gets on her feet she is carrying a heavy uterus with long ligaments, and if the support from below is imperfect, there is all the more tendency for the organ to take a low position, and with a low position retrodisplacement may be favored.

I believe that the first six months after confinement is a very much more favorable time for correction of displacement than the latter six months of the first year. It would be advisable to make the correction as early as possible. One per cent of effort will gain then 10 per cent perhaps of results, while later, 10 per cent of effort will sometimes not gain 1 per cent of results.

The satisfactory thing about this work is that so many cases were cured and stayed cured after the removal of the pessary.

DR. HIRAM N. VINEBERG, NEW YORK CITY.—I can only reiterate what the last speaker has said as to the debt the Society owes to Dr. Lynch for his very excellent statistical paper. No one, who has not seen Dr. Lynch's organization, can realize how he was able to present such a valuable contribution, because his organization is complete, and that has been shown by what he has been able to find. He has been his own severest critic by a 100 per cent follow-up. We are satisfied in New York if we have 25 per cent. The valuable thing to me Dr. Lynch has brought out is the late development of these displacements after delivery. Formerly, we were all satisfied and we thought we were making an advance in our former observations if we examined patients six weeks after delivery, and if a patient had no

complications at that time, that patient was considered all right. Dr. Lynch has brought to our notice the fact that in a great many cases these displacements only occurred four months after delivery, and a great number even later.

The last speaker (Dr. Barrett) has drawn attention to the fact that by recognizing these cases early, pessary treatment is all that is necessary in a very large percentage, 72 per cent. We know that ordinarily, if we take cases as they come to our office, if we get as much as 5 per cent permanent cures with pessaries, we are doing as much as we can expect. Here, taking these cases early, Dr. Lynch has shown us that we can get as much as 72 per cent cures.

I was a little disappointed in that Dr. Lynch had not attempted what to my mind is the simplest operation on the round ligament, and it is one which I have followed for over twenty years. It is the Ohlshausen procedure, somewhat modified, and that is, passing two sutures around the ligament, the first one quite close to the horn of the uterus practically where the ligament is inserted into the uterus, and the other one a little bit farther out. That attaches the strongest part of the ligament and it is a simple procedure. I have seen a great many of the operations done on the round ligaments, and I have been surprised at the amount of surgery that was done when the same anatomic results could be achieved in so simple a manner and with so little traumatism.

I can only speak definitely of the results in my private cases for the past fifteen years and I have had 124 cases of suspension by the round ligaments in this manner; 30 of these patients afterward became pregnant; three had two children, one had three, and there was one abortion at four months. I was able to observe these cases after delivery, and in every instance the uterus remained forward.

DR. WILLIAM E. STUDDIFORD, NEW YORK CITY.—We have been making investigations along the same lines that Dr. Lynch has indicated, and have found just as he did that with the question of retroversion, or displacement, occurring following operative deliveries and forceps and normal deliveries there was little difference. Our conclusions are about the same regarding the use of the pessary.

There are two or three other factors in the condition that I feel are of great importance. First, the question of a properly adjusted corset or abdominal binder. Many of these cases of retroversion have markedly relaxed abdomens, and one reason that we have fewer cases in private patients is the fact that they are able to buy suitable clothing, so that the abdominal support is better. We find in many working women that they either wear no corset at all, or their clothing is supported around the waist with a constant drag on the abdominal walls which tends to increase the retroversion.

One other factor of importance is the question of focal infection. In many of these cases the condition of the teeth is a factor in causing a certain amount of relaxation and a part of the general effect of the infection on all their muscles. Another condition that is of some importance is the condition of the cervix. You find in many of these cases six weeks or a month after delivery there is more or less erosion of the cervix, with some involvement of the glands of the cervix which leads to probably a mild focal infection at that location, and that probably has an effect on the ligaments that Dr. Williams has mentioned as a supporting factor. We have found in many of these cases, if we treat the condition of the cervix and improve that, the tendency to retroversion is lessened.

Another point: These cases which are relieved temporarily by a pessary, but not cured, form the ideal cases for the Alexander operation. That operation by shortening the round ligaments through the canal brings up certain fascial attachments connected with the round ligament that tend to lift the bladder and the anterior layer of the broad ligament, and will correct some of the varicosities that

occur in the broad ligament, and will do it in a way that no other operation of which I know will accomplish. Some of the most satisfactory results I have ever seen are in those cases of this type in which the Alexander operation has been done.

DR. JOSEPH BRETTAUER, NEW YORK CITY.—I should like to endorse Dr. Studdiford's remarks regarding the Alexander operation. In my hands it has proved absolutely satisfactory and is easily performed. Very rarely was it necessary to resort to some other method on account of too thin ligaments or too great difficulty in isolating them.

Furthermore, I believe that Dr. Williams has struck the keynote of the situation. The etiology of postpartum retroflexion has nothing to do with the ligaments; the cause is the uterine wall itself and a proper postpartum management of the patient will decrease to a large extent the occurrence of this condition. By this I mean the careful management of the bladder and the discarding of the tight abdominal binder, which private patients regard as such an important feature immediately after delivery.

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MARYLAND.—The statistics of Dr. Lynch bear out to a great extent my own. My attention was first directed to this subject a number of years ago when I found my private patients presented more retroflexions than ward patients. When I came to analyze the reasons I found that the private patients were examined 6 weeks after labor, whereas the ward patients were examined two weeks after labor, and when we got the ward patients six weeks after labor they presented approximately the same incidence. It therefore, appears that retroversion develops somewhere between the second and sixth week. Without giving accurate statistics at this time, I may say that at least one-third of our women develop a retrodisplacement of some kind.

What Dr. Lynch says about the pessary is quite correct, and I should say it will cure the condition in 75 per cent of the cases. In many cases in our material we did not need a pessary; as all that was necessary was to replace the retroverted uterus manually at the end of six weeks, have the patient return in a week, when it was found that in quite one-half of the cases the uterus remains forward. When this is not the case a pessary is needed.

One important factor which has impressed me is that such conditions should be treated as early as possible. When we get the women back at the end of a year to check our findings, we find that when a good result has been attained at the end of six weeks, it is maintained at the end of the year.

I do not believe that retroflexion is due to a relaxation of the ordinary uterine ligaments. I take it, the cause lies in undue distention of the tissues at the base of the broad ligaments, the so-called ligamentum transversale colli, which are spread apart by the act of labor and have not retracted sufficiently when the woman begins to go about to support the large uterus, when displacement occurs. If the uterus is put forward in such cases, retraction takes place in the normal way and *restitutio ad integrum* usually results.

What we need to work out in puerperal cases is the status of affairs at the base of the broad ligament. This means that when such women die, we must get their bodies and make frozen sections, which may give us an insight into the state of affairs in the pelvic floor and at the base of the broad ligament. We hope within a reasonable time to report some work on this subject, which may be more or less conclusive.

DR. G. BROWN MILLER, WASHINGTON, D. C.—I am sorry Dr. Lynch did not use the word retrodisplacement instead of retroversion for one or two reasons. I have been following very carefully for a number of years my private obstetrical



cases and found a few years ago 25 per cent of them had retrodisplacement following labor. I think common sense will teach us that the most important factors in retrodisplacement after labor are the same as those in a retrodisplacement or retroversion in a relaxed vaginal outlet and a laceration, where the uterus gets lower and lower, falls over backward and tends to come out.

I agree with Dr. Channing Barrett that lengthening of the ligaments, especially the round ligament, and relaxation of the support at the floor of the pelvis are the two main things that cause retrodisplacement following labor.

I have had a certain number of cases which do not seem to bear out what Dr. Williams has said. In these cases the uterus has not remained in ante-position following replacement with a pessary. These are the cases in which there was retrodisplacement before pregnancy. In practically all these cases in my private work the uterus would not stay in anteflexion or anteversion after the pessary had been removed. So the injury at the base of the broad ligament of which Dr. Williams spoke need have no bearing in such cases.

The reason a retrodisplacement occurs after the second week is apparent to me because before that time in the majority of cases the uterus is too large to be contained in the true pelvis. After it undergoes involution and gets smaller, it falls into retroversion.

DR. ALFRED B. SPALDING, SAN FRANCISCO, CALIFORNIA.—We have followed a small series of cases in the clinic along the same line, tracing them for about six months after delivery, and of 300 patients that were followed we have found practically the same as Dr. Lynch, an incidence of 44 per cent of retroversions. But in dividing this series into three groups according to age, one group from 18 to 28, another from 28 to 38, and a third from 38 to 48, some interesting things have been brought out, and among them we have found that the younger patients have the largest percentage of retroversions, and the older patients have the least number of retroversions. Why that is, we do not know.

In my private work I have for some time been interested in testing the influence of the kangaroo walk by asking every patient, before I examined her, have you taken up the kangaroo walk, or have you not? About 50 per cent of the patients we find have taken up the kangaroo walk, and these have had 50 per cent less retroversions. Some patients would say that they had forgotten what the kangaroo walk was. We tried to show them the kangaroo walk in the wards. We succeeded in having one patient walk down the ward, and all the other patients replaced their retroverted uteri by laughing.

In regard to the operative results of retroversions, after reviewing our entire series of replaced uteri by operation and studying every effect on future pregnancies, we have reached the conclusion that the best results have been those obtained by the Ohlshausen or Gilliam operation.

DR. J. WESLEY BOVEE, WASHINGTON, D. C.—We are losing sight of the congenital retrodisplacements of the uterus; we are not checking them up with this series, and therefore we cannot place too much reliance on crediting labor with the production of the retrodisplacement.

There are certain features about the puerperal treatment of these patients that seem to me of importance, and one is to get the patient off her back as soon as the third day after delivery, if possible; keep her on the abdomen largely; the uterus is small enough after three days to fall below the promontory of the sacrum. Before that it is not.

Another feature is to see that the bladder is kept empty. Women after delivery, as a rule, have retention of urine; the bladder becomes very much distended, and following the work of Dr. Curtis and Dr. Watkins I have made free use of the

catheter. My patients are catheterized every six hours with regularity, provided they have not voided before the six hours is up. By keeping the bladder empty strain is taken off the round ligaments.

I think Dr. Williams has given us a special point of value in the production of the retroversion. I do not see any advantage in pinning our faith so strongly to the round ligaments. We find, at times, the round ligaments are mere strings, like the ordinary sized string we tie a package up with, so what is to be gained in shortening that ligament? I think we will have to look elsewhere for support. It seems to me, we should attract attention to the lower pole of the long axis of the uterus and not the upper pole in retroversion of the uterus. Dr. Lynch said he found the uterosacrals were not attached to the sacrum. That is because the ligament was not in the operation probably sutured to the periosteum of the upper part of the first segment of the sacrum. If you will suture it to the periosteum, you are more apt to get good fixation posteriorly and get the cervix pulled backward.

DR. DOUGAL BISSELL, NEW YORK CITY.—I would like to emphasize several points that were brought out in this discussion, particularly that referred to by Dr. Williams, namely, the importance of the fascial structure surrounding the cervix. To my mind this is the chief supporting structure of the uterus.

The next point is that regarding the overdistention of the bladder; the importance of not allowing the bladder to become overdistended after labor should always be emphasized, and the bladder should be emptied every six hours after every retroversion operation. If the use of a catheter becomes necessary, there is no objection to it, provided it is used with surgical precautions. I think that most of the failures of operations for the correction of retroversion are due to the fact that the ligaments are overstretched by distention of the bladder within the first ten days after operation.

I have, among the exhibits at this meeting, a model or manikin made by me several years ago which was devised to demonstrate the action of the fascio-muscular structure in which the cervix is embedded; also the change in position of the corpus uteri when the bladder distends. When the rubber balloon, which is introduced into the cloth bag representing the bladder is inflated, the corpus will be seen to recede until it reaches the sacrum. Under these circumstances, the round and broad ligaments will be put on a stretch, and when the air is allowed to escape from the balloon, diminishing the size of the bladder, the corpus will be seen to move forward, as the result of the action of both these lateral ligaments and of the fascio-muscular diaphragm.

DR. WILLIAM C. DANFORTH, EVANSTON, ILLINOIS.—In going over the records of 250 private patients we found an incidence of puerperal retroversion of 20 per cent. These figures are given approximately and almost agree with those of Dr. Lynch. In every one of these in which examination early in pregnancy showed a retroversion, it recurred after delivery. I wonder if some of the cases which appeared in Dr. Lynch's series were not of the congenital type rather than caused by the pregnancy and labor.

With reference to pessary treatment immediately, that is, within six or eight weeks after confinement, we have gotten permanent results in 75 per cent, as shown by follow-up observation.

I believe the point brought out as to the position of the patient is important and for some years we have been routinely having our patients turn over and lie on the abdomen as soon as possible. We have also made use of the catheter in the manner suggested by Dr. Curtis.

With regard to the kangaroo walk, I tried it when Dr. Polak first suggested it,

but whether women in Chicago are less amenable to suggestion than they are in Brooklyn, I do not know. Many of our patients could not be induced to try it.

We have, however, had some successes with simple knee-chest posture, and simple postural methods have a definite value.

DR. GEORGE W. KOSMAK, NEW YORK CITY.—There is one feature not touched on by those who have discussed the paper, and that is the necessity of making repeated and late postpartum examinations. Many physicians are neglectful of this point. They dismiss private cases at the end of fourteen days and may not see them again until a succeeding pregnancy.

The production of a retroversion is not limited to two or three or four weeks after labor, and I have made it a point to examine all my private cases three months after labor, and even at the end of the third month changes are found which were not noticed at previous examinations.

Another point brought out by Dr. Studdiford is the question of proper procedures in cases of cervical laceration, or cervical erosion, so-called. I think it is very important to treat all these cases, otherwise there will be a resulting low grade pelvic infection, very often centered to the region of the culdesac. The presence of this infection in many cases precludes the use of the pessary. Even if you do get the uterus forward in these cases and insert a pessary, it causes a great deal of discomfort, because the head of the instrument presses against the inflamed area. It is much better to treat these cases by manual replacement, putting in a tampon and instructing the woman to assume the knee-chest position or "kangaroo walk."

DR. LYNCH (closing).—The discussion has covered many points of interest. Dr. Miller's criticism is quite justified since the paper deals with retrodisplacements. Our results in another series indicate that pressure on the bladder during labor is one of the great causes of prolapse. We were chiefly interested during the preparation of our paper in the etiology of retrodisplacements. We have come to the belief that congenital displacements may be more common than realized. We have utilized nearly all methods of treatment in attempting to prevent retroversions. Our puerperal cases are encouraged to move about in bed as soon as they are able after labor. On the second day they are turned on their face. As soon as they are out of bed, they are taught the knee-chest position, and later are urged to use the kangaroo or monkey walk.

The subinvolution cases are treated by replacement and pessary when the uterus is retroposed, and by ergot and tampons if the organ is forward. Our study convinces us that no one type of retrodisplacement operation can be used for all cases. We have been greatly interested in the reason for recurrences of the retroversion after operation. There is no doubt but that if the basal support of the uterus is good, a little restraining force suffices to hold the fundus in the forward position. This has been well shown by the success which attended the great majority of ventro-suspension operations. Yet the basal support is not always good and considerable check is usually necessary. Therefore, if the round ligament is not firmly fixed in the inguinal ring, it will gradually pull out and allow the fundus to fall backward, even if the fundal insertion of the round ligament is in its normal high position. If the fundal insertion of the round ligament is not high up on the fundus, but has slid down, as so often happens in chronic retroversions, no amount of forward traction will do else but bring the uterus forward en masse without causing flexion. We believe that failure to recognize these two points explains the majority of operative failures.

DR. EDWARD A. SCHUMANN, of Philadelphia, Pa., read a paper entitled **Observations on the Pathology and Treatment of Hydatidiform Mole.** (For original article see page 386.)

#### DISCUSSION

DR. J. WHITRIDGE WILLIAM, BALTIMORE, MARYLAND.—I would take issue with Dr. Schumann as to his radical treatment. When he quotes me, all that I can say is that when one writes a book one gets into all sorts of trouble. I have forgotten the figures in my book, but I must have said what Dr. Schumann has quoted; in which event I wish to amend my statement. I have seen approximately twenty cases of hydatidiform mole, and only one of them was followed by chorioepithelioma. The uterus was removed, and the patient was well three years afterward.

There is no doubt of some relationship between hydatidiform mole and chorioepithelioma. A very instructive article has just appeared by Sunde in the *Acta Gynecologica Scandinavica*, in which, after analyzing the question carefully, he concludes, roughly speaking, that 50 per cent of chorioepitheliomata are preceded by moles, while only 5 per cent of moles are followed by chorioepithelioma. If that is the case, I do not think it is justifiable to sacrifice the uterus as a routine procedure except in women approaching the menopause. In the only case of chorioepithelioma following a mole, which I saw and followed up, strange to say, I advocated removing the uterus with the mole because the woman at that time was forty odd years of age and was not likely to have more children. She, however, elected to keep the uterus, but within three months she returned with chorioepithelioma. We removed the uterus and she was well three years later.

The high figures of Meyer concerning the incidence of hydatidiform mole, are wrong. Meyer based his diagnosis on myxomatous degeneration of the stroma of the chorionic villi; while most pathologists, following the lead of Marchand, lay stress upon the proliferation of the chorionic epithelium. In most of Meyer's cases the former, but not the latter, condition was present, and therefore my opinion is that what he described was a degeneration following the death of the embryo and not a new growth.

The specimens which Dr. Schumann has shown are not altogether convincing to me, because if you take sections through the placental site in any uterus (normal pregnancy or mole), in most instances, an invasion of syncytium away down in the uterine muscle will be noted, and I do not think in several of his specimens there was more infiltration than I have seen in many normal uteri removed at cesarean section.

To summarize, I think that Dr. Schumann's attitude is a little too extreme, and that the figures quoted in my book exaggerate the seriousness of the condition. Men do report abnormal cases, but not normal ones, so that we have gotten in this way a totally erroneous impression of the dangers associated with moles. Sunde, to whom I have alluded, got his statistics by correspondence with the clinics in Scandinavia, finding out which of the patients had hydatidiform mole, and following them for five or more years, with the net results that only 5 per cent of them developed chorioepithelioma.

The other dangers of the mole are in great part due to faulty technic and can be largely avoided. I saw recently a specimen which was of the greatest interest in this connection. An assistant in the pathologic department of the University of California kindly sent me a specimen a few weeks ago which represented the uterus and appendages removed for hemorrhage some time after the extrusion of a hydatidiform mole. Away out in the broad ligaments as far as the ovary, the vessels were distended by vesicular villi, which could be seen with the naked eye. Under

the microscope it could be seen that in certain places the chorionic epithelium was invading the walls of the vessels. In this instance the patient was well fifteen months after the panhysterectomy. It was an extraordinary case, particularly as it showed the extent to which a growth can extend without causing a fatal issue.

DR. HIRAM N. VINEBERG, NEW YORK CITY.—I have been interested in the subject presented by Dr. Schumann for a number of years and desire to mention a few clinical points which the doctor left out and to draw attention to the frequency with which cystic degeneration of the ovaries occurs with hydatidiform moles. Fränkel has collected 100 cases and he claims in the majority the stroma is not involved and retrogression will occur. In my own experience I have had two cases, one in which both ovaries were the size of one's closed fist. After removal of the hydatidiform mole, I had the patient in the hospital for two or three weeks and then I had to remove both ovaries.

I desire to mention also the frequency with which nephritis and albuminuria occur in cases of hydatidiform mole, 20 per cent, yet at the same time, it is rare to have eclampsia develop, chiefly due to hydatidiform mole occurring early and eclampsia late in gestation.

I have had two cases of eclampsia and hydatidiform mole, one in a young woman of twenty-five and in another one at eighteen. In one of these cases, some thirteen years ago by accident I learned the value of employing hysterotomy to empty the uterus of the mole. The patient was five months pregnant; she had a severe eclampsia, and I emptied the uterus through a hysterotomy from below. I opened the uterus, and to my great surprise I found nothing but the hydatidiform mole. I put in my hand, emptied the uterus completely, and was able to palpate the whole interior of the uterus with my hand. Since then, knowing by my experience before, that in emptying the uterus through the cervix in the ordinary way, there was considerable hemorrhage and uncertainty in getting the uterus completely emptied, I have made it a rule to do a vaginal hysterotomy in every case for the purpose of being sure to empty the uterus of all the vesicles, and at the same time being able to palpate the interior of the organ; in doing so if one finds a hard nodule, one may assume he is dealing with a chorioepithelioma. In one of my nine cases of chorioepithelioma, the diagnosis was made in that way. I then and there removed the uterus through the vagina. Microscopic examination afterward confirmed the diagnosis of chorioepithelioma.

I take the same position as Dr. Williams in these cases, i. e., that it would be entirely too radical to operate and remove the uterus in every case of hydatidiform mole. We see in our hospital practice four or five cases of hydatidiform mole each year, and apart from those that subsequently developed chorioepithelioma, the simple removal of the mole was sufficient. I am surprised at the figures given here as to the fatalities of this condition.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIFORNIA.—There is doubtless a great difference between the malignancy of the syncytial and Langhans' cells. Ever since Marchand's early work on the classification of chorioepithelioma, many have attempted to correlate the malignancy of the tumor with the histologic pictures of its cells. None, however, have done more than von Velits and Schmauch more than seventeen years ago when they insisted that the Langhans cells were the important cells in determining the degree of malignancy of the tumor. More recently, Ewing has also emphasized the fact that the syncytioma and a syncytial endometritis are not as malignant as choriocarcinoma. Therefore, in the type of case under discussion, we should be greatly interested in the character of the fetal cells found in the uterus underlying the placenta. Most of these appear to be syncytium.

Of course, it is perfectly reasonable to claim that chorioepithelioma usually de-

velops from differentiated fetal ectoderm since the majority of cases develop in early pregnancy when there are two layers of fetal ectoderm. More than 20 per cent of the 455 cases of chorioepithelioma collected by Pollosson and Violet followed pregnancy at full term. If the tumor had originated at this time late in pregnancy, it could have developed only from syncytial cells if the tumor originated in the chorion, since at this time the Langhans cells have disappeared.

We have recently seen a case of chorioepithelioma in a woman of 54, who never had a miscarriage or a hydatidiform mole. She had 15 children at full term, the last of which was born fifteen years ago. She had been in the menopause for four years.

DR. BENJAMIN P. WATSON, TORONTO, CANADA.—My experience will bear out what has been said in the discussion of this paper regarding possible malignancy following hydatidiform mole and the relationship of chorioepithelioma malignum to hydatidiform mole. We have seen in the last eight years 17 cases of hydatidiform mole. These patients have been followed, with no fatality in any case. The moles were evacuated through the cervix and in no instance had chorioepithelioma malignum followed. Of three cases of chorioepithelioma malignum, in only one of these was there an antecedent mole found. I have felt the danger of this condition has been very much exaggerated simply because a very large number of cases of hydatidiform mole that have terminated favorably have not been reported in the literature, and we have a totally erroneous idea as to the seriousness of this condition.

I feel as do others in the discussion, that routine hysterectomy for hydatidiform mole is too radical a procedure. The last two cases of hydatidiform mole I have seen within the past three months were both in young women who were pregnant for the first time. We should try to clear out the uterus promptly in these cases. I dilate the cervix and with a small open forceps evacuate the mole through the center of the mass, keeping the hand on the uterus, getting the mass reduced until I can introduce the finger or curette. If that is done carefully, there is no risk of perforation, and sepsis should be avoided. If the patient is kept under observation for the next two years and curettage is done immediately after any irregular hemorrhage, chorioepithelioma malignum can be detected at an early stage.

DR. E. E. MONTGOMERY, PHILADELPHIA.—I have seen two or three patients with hydatidiform moles similar to the ones described, who were not subjected to operation. One of these, whom I saw twenty years ago is still living and in good health. I have operated on several patients for chorioepithelioma and in none had the condition been preceded by hydatidiform mole.

DR. HIRAM N. VINEBERG.—In my nine cases of chorioepithelioma, four were preceded by hydatidiform mole.

DR. THOMAS J. WATKINS, CHICAGO.—Hydatidiform moles unquestionably are not as dangerous of becoming malignant as has been generally assumed. I would suggest as a prophylactic measure the introduction of radium into the cavity of the body of the uterus after removal of a mole, as the cells are of a variety that are especially susceptible to radiation.

DR. EMIL NOVAK, BALTIMORE, MARYLAND.—Dr. Williams has already called attention to the recent investigations of Meyer on this subject. His figures as to the incidence of hydatidiform mole were quite striking. He believes that the ordinary hydatidiform mole described in the literature, corresponding to the type described by Dr. Schumann, represents merely the end product of a process which, in its early stages, is commonly overlooked. This undeveloped variety of hydatidiform degeneration Meyer believes is the cause of a large number of early and other-

wise unexplainable abortions. He lays great stress upon the stromal and blood vessel changes which occur in connection with these early forms of hydatidiform degeneration. I have studied the material obtained from a large number of cases of incomplete abortion, and, like Dr. Williams, I have not been able to convince myself of the identity of the degenerative changes described by Meyer with genuine hydatidiform mole. On the other hand, in cases of tubal pregnancy, I have encountered a number of sections which, microscopically at least, I could not distinguish from hydatidiform mole. On the whole, Meyer's study is extremely suggestive, although he cannot be considered to have proved his point as yet. The important desideratum is the demonstration of transition stages between the early changes described by him and the changes characteristic of the fully developed variety of mole with which we are all familiar.

One point brought out by Meyer, with which I have likewise been much impressed, is the relatively slight degree of trophoblastic change observed in many moles. Some of our own sections show a practically normal trophoblast, even though the villi are tremendously hydropic.

With regard to the frequency with which malignancy develops in these cases, I am convinced that this is much less than has been commonly asserted. Of eight cases which I have recently studied, all are living and well after simple evacuation of the uterus. The proper procedure with hydatidiform mole is to evacuate the uterus thoroughly, and then to keep the patient under observation for a period of months. If bleeding persists or recurs, it is probably best to perform hysterectomy. Even then, in a certain number of cases, the disease will prove to have been non-malignant. There is no field in which mistakes are more easily made than in this. To illustrate, some years ago, within a short period of time, five uteri were sent to Dr. Cullen's laboratory, all said to have been removed for chorioepithelioma. Of the five, only one proved to be actually the seat of this disease, the others showing perfectly benign conditions associated with normal pregnancy. It is usually said that about 50 per cent of all chorioepitheliomata follow hydatidiform mole. There is no reason to believe that this proportion is overestimated. On the other hand, I am convinced that it is an exaggeration to say that 10 per cent, or even 5 per cent of hydatidiform moles are followed by chorioepithelioma. Some authors, like Findley, put the proportion as high as 25 per cent. Of course, if future work shows that hydatidiform mole is, as Gierse and Meyer believe, exceedingly common, the proportion of cases in which malignancy occurs will drop far below the present estimate,—to one or two, or even a fraction of one per cent.

DR. ALFRED B. SPALDING, SAN FRANCISCO, CALIFORNIA.—Two years ago my associate, Dr. Stevenson, treated a patient with very marked chorioepithelioma, with invasion of the wall, whose hemoglobin had been reduced to over 30 per cent, and who was in such a precarious condition that even curettage was not thoroughly done. He treated the patient with radium, using 100 milligrams, which was followed by complete restoration of the uterus to its normal condition, and the patient has remained well since.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIFORNIA.—I have recently treated with radium a case of chorioepithelioma, which had been having symptoms for two months. She did not seem to be a good operative risk, so we gave her about 3500 millicurie hours of radium, by leaving 175 millicuries of radium emanation in the uterine cavity for twenty-four hours. We were compelled to do a hysterectomy eight weeks later, because the symptoms persisted. This case was a typical choriocarcinoma. Dr. Stevenson's case, which Dr. Spalding mentions, was a syncytioma, a mass composed chiefly of syncytial cells.

DR. SCHUMANN (closing).—We must take published figures at face value. Therefore, when Dr. Williams states in his textbook that the mortality following hydatidiform mole is 20 per cent, it must be assumed that these figures are accurate. Further, when Findley's analysis of 500 cases reveals a total mortality of something over 20 per cent, I must take these figures as definite. It follows then, that as far as we know the mortality of hydatidiform mole is entirely too high.

I do not advocate hysterectomy for every case of hydatidiform mole, but do insist that the tumor be studied *in situ*, by abdominal hysterotomy, and that it be shelled out under the eye, if possible, and the uterus closed. But when the myometrium is seen to be the seat of small hemorrhages, and when invasion of its structure is deep and extensive, then hysterectomy is the procedure of choice. The blind curettage and packing advocated by Dr. Watson, belongs in my opinion, to a bygone age of surgery and is entirely out of place today.

From the tenor of the discussion it would seem that cases of hydatidiform mole are not usually regarded as serious. In my experience this type of case is frequently a desperate surgical risk, the patient infected and profoundly exsanguinated. I believe these women stand a far better chance for their lives by the proposed plan of hysterotomy, after blood transfusion, if necessary, than by curettage and packing.

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DR. RICHARD R. SMITH, of Grand Rapids, Mich., read a paper entitled **Prolapse and Eversion of the Urinary Meatus in the Female with Special Reference to Surgical Cure.** (For original article see page 395.)

#### DISCUSSION

DR. GEORGE GRAY WARD, JR., NEW YORK CITY.—I have only seen one case of what I should classify as a complete eversion of the urethral mucosa. We see cases of moderate eversion of the urethral mucosa, but the condition in which there is a real prolapsus, a turning inside out of the urethral mucosa, is rare in my experience.

In looking up the recent cases in the Woman's Hospital, I was able to find only four that I could classify under this heading. One was seen in the cystoscopic clinic in which there was a complete turning out of the urethral mucosa which was treated by fulguration. Two other cases were treated by operation. My case was rather extraordinary in that there was no preceding symptomatology which would lead one to expect such a condition. The woman was perfectly well, and suddenly, after straining at stool, was seized with an acute pain referable to the urethra. This had been going on for four or five days, and the mass was as large as the end of the thumb, very much swollen and intensely painful. It consisted, as was shown at operation, mostly of the posterior wall of the urethral mucosa, with about one-third of the anterior urethral wall. The patient was sixty years of age, had had no prolapse, no laceration and no pelvic floor injuries. It is difficult to understand how it occurred, except that she had a wide open external meatus.

I first tried palliative measures to reduce the swelling, but without any success. I removed the mass by amputation and dissecting out the urethral mucosa, so that I could draw the edges down and suture them to the margin of the vestibule. I was apprehensive about removing so much of the posterior urethral mucosa, thinking I might have some serious results, but it produced no discomfort at all. The tissues stretched out, she has perfect control, and has experienced no subsequent difficulty whatever.



DR. THOMAS J. WATKINS, CHICAGO.—I concur entirely in what Dr. Smith says. The etiology can be summed up as being due to increased mobility, infection and atrophy. The reason that caruncles appear generally after the menopause because the atrophy affects the vaginal more than the urethral mucosa.

Increased mobilization can be rectified by suture or by the introduction of needles of radium between the vaginal and urethral mucosa, the choice of treatment depending upon the variety of increased mobilization. Where the entire urethral body is displaced, it should be fixed by sutures, which will replace it in its normal position and give it a condition of relative fixation. Satisfactory results can only be obtained in some cases by seeing to it that the bladder wall is sufficiently elevated.

In cases of prolapse of the mucous membrane, which has somewhat the appearance of a rectal prolapse, I would advise a modified "Emmet button-hole" operation. An incision is made through the vaginal mucosa down to the body of the uterus. The urethral body is then grasped with tissue forceps, retracted so as to overcome the prolapse, and fixed by firm sutures. This, I believe, accomplishes the desired result without opening the urethra.

DR. HERMANN J. BOLDT, NEW YORK CITY.—I was particularly interested in the case reported by Dr. Ward. I believe if Dr. Ward will examine the history of his patient carefully, he will probably find in that particular instance the etiologic factor was due to atrophy of the vulva and vagina, which is also participated in by the muscularis and submucosa of the urethra, and we have them as a result, the mucosa protruding. We get practically eversion of the mucosa. When these cases are of long duration and when they occur slowly and when the protrusion is not large, they seldom give rise to serious symptoms. In the acute conditions the mucosal tumor when it protrudes from the urethral opening, resembles frequently succulent raspberry in appearance and signs. It gives trouble and pain, and, if not reduced, we have circulatory changes; not infrequently at the base, gangrene and necrosis occurs.

Straining at defecation, in all probability, is correctly interpreted by Dr. Ward as a factor.

I do not believe any of us can have a large experience with this class of patients because during the period of from 20 to 45 years they occur seldom, and when they do occur, it is the result of traumatism in labor, protracted labor, pressure on the urethra, all causing more or less traumatism of the muscularis. Then partial separation of the mucosa occurs, and we may have a partial descensus or diverticulum forming or a circular prolapse.

With regard to the treatment, I can add nothing except to endorse what Dr. Watkins has said. I believe that is the most rational method, and the only one that ought to be pursued. It is far superior to the button-hole operation devised by Emmett.

But there is one method not spoken of, that devised by Fritsch years ago; namely the introduction of a Nelaton catheter into the urethra and applying a silk ligature around the catheter. In the course of two or three days adhesions take place between the mucosa and the meatus, and complete restoration occurs. There is absolutely no risk and no blood lost. In the majority of cases this method will yield good results.

With regard to direct surgical intervention, I should like to add a few words namely, when excising the mucosa not to draw it down too much with the mouse-tooth forceps. One may excise more than is desirable, and the mucosa, after it has been excised, has a decided tendency to retract farther than desirable.

DR. CHANNING W. BARRETT, CHICAGO.—I have had two cases in children in which the urethra rolled out. In one the urethra was followed by a small portion of the bladder. This was replaced before I saw the case. I did not believe so much tissue could come out with the condition found when it was reduced. By having the patient strain at stool or urination, this could be brought out again, and yet it would go back easily. The child was quite young. The treatment required in that case, was to prevent the child from straining at stool. In instructing the patient to lie down for urination it made a great fuss, but when it would urinate the mother would keep up the support. No surgical procedure was adopted in this case. I have seen one case where the urethral prolapse came out acutely and was about the size of a dime. A certain degree of prolapse is very common in traumatism. We see plenty of cases where there is traumatism of the outlet in the urethra; there is a mobility of from one and a half to three inches. In this instance, instead of doing the vesicocele operation, we carry the incisions down to the vestibule and along upside the urethra. Much of the circumference of the urethra is taken away, making the opening smaller. Sometimes the upper stitch that closes it is caught in the lower end of the urethra, without an incision running up the urethra, but in other cases it is so extensive and the urethra is so patulous, a V-shaped section is taken out quite a distance from the urethra and closed. I am glad to say, I have found no case in which I found it necessary to do a pathologic interposition operation to cure this prolapse of the bladder and urethra.

DR. DOUGAL BISSELL, NEW YORK CITY.—My experience in this particular phase of surgery has been limited to three cases. They were of several years' standing, in women over forty years of age. One of these cases was successfully treated by fulguration.

The first case showed a large protrusion of the mucous membrane of the urethra. I operated very much the same way as I do the Whitehead operation for the removal of extensive hemorrhoids. A cone shaped section of the urethra, about one-third of its approximal portion was made. The mucous membrane of the urethra was anchored with silk at four points equally separated, to the mucous membrane of the vagina; then a continuous line of suture, No. 0 catgut, adjusted the cut edges of the mucosa around the entire urethral orifice. The piece of tissue removed in this first case, was sent to a pathologist, and he termed it "hemorrhoid of the urethra". It was the first time that I had heard the term hemorrhoid applied.

The third case was the one referred to by Dr. Ward. She was sent to me by a physician with a diagnosis of "a malignant growth of the urethra." The protrusion of the mucous membrane through the meatus was very marked, but showed no signs of malignancy. A cancer was found, however, in the vault of the vagina. This case was subjected to radium treatment, after which I operated for a prolapsed urethra.

DR. SMITH (closing).—I think the cases of marked eversion of the urethral mucosa are very rare, but those of lesser degrees, the small ones, are very common and often produce symptoms. When they do they should be corrected, and that can be determined by the history given by the patient and by the presence of tender areas about the meatus.

## NEW YORK OBSTETRICAL SOCIETY

MEETING OF APRIL 11, 1922

(Continued from page 190.)

DR. I. KROSS (by invitation) read a paper on **Degeneration of the Ovaries after Hysterectomy; an Experimental Study.** (For original paper, see page 408.)

### DISCUSSION

DR. J. O. POLAK.—The pendulum has swung twice in my clinic from conservatism to ablation and now it has swung back to conservatism and, notwithstanding the conclusions of the essayist, I am convinced, from a recent study which we are preparing, that the menopausal symptoms are not as severe where the ovaries are conserved as where they are removed. We have just reviewed about 360 cases of fibroids and are studying the blood pressure in these cases where the ovaries have been left and the ovaries have been removed, excluding the cases that had hypertension prior to operation, and it is very interesting to note the effect of the removal of the organ and the disorganization that takes place in the interglandular relations by the removal of these organs, on the pressures, and, clinically, I am more and more convinced that patients are better off, even for the few years or few months that the ovary retains its function.

I do not believe that we can always make our deductions from experimental studies on animals.

I question the fact whether the circulation cannot be conserved better than the doctor has spoken of. I am sure that in a certain number of these cases where hysterectomy has been done that the circulation can be conserved to a greater or less extent in the ovary, particularly when the tube is retained. Certainly clinically in the last few years our experience has been that the patients are more comfortable and that they have fewer menopausal symptoms when the ovary is conserved.

DR. H. N. VINEBERG.—In reference to the subject of conserving the ovaries and in being able to do the operation in such a way that the blood supply from the uterus can be retained, I would say that the subject has been very thoroughly investigated. It would be interesting to know why Dr. Polak doubts his former observations in connection with 300 cases. I think Dr. Polak attaches too much importance to blood pressure. We do not know enough about blood pressure to attach enough importance to it as to be able to say whether a certain procedure is advisable or not. I am told by the internists that the change of pressure of patients in their office will vary from 10 to 20 millimeters while they are being examined.

DR. HAROLD BAILEY.—Several years ago I had some experience in studying the metabolism of dogs following the removal of the ovary and, to hark back to the early results of 1899, Hugo Lüthje found no difference in metabolism after the operation. Loewy and Richter then in three or four dogs discovered a considerable difference. Their work was a great aid to those who believed in conservatism. Dr. Murlin and I worked on two animals but our work was interrupted by the war and was never continued. As a result of our study for a

period of three months on these animals we were not willing to commit ourselves, but the actual findings, with all deductions, indicated a reduction in metabolism of 6 per cent in one animal and in the other of 12 per cent, and if we did not make deductions the difference in metabolism would have been somewhere between 12 and 15 per cent. Now this apparently favors conservation.

DR. TAYLOR.—There is another point that has not been brought out in this question of conservation of the ovaries. While it is probably true that the ovaries if retained will lessen the symptoms of the artificial menopause there is a decided risk of degenerative changes in the ovaries with definite pain and physical discomfort. While the vasomotor disturbances of the menopause may be more severe if the ovaries are removed there is less danger of pain and physical discomfort.

DR. HERMANN GRAD.—There are two points that have not been touched upon in connection with this subject. First, we know very definitely that some women have disturbances with their menopause without any operation; on the other hand there are others who have very little disturbance. When one removes a uterus it is difficult to tell whether the particular patient under normal conditions would have had much disturbance or not at the time of the menopause. The second point is this, when one conserves an ovary, it is impossible to predict that it will or will not become infected. This must also be taken into consideration.

In my own experience perhaps I have been unfortunate but I found in several instances that these conserved ovaries have become infected and a second operation had to be done. In three cases it proved to be a very serious affair, and while we may feel at the time of operation that the woman has had an infection, it does not mean that if one conserves the ovary it will become infected. In a great many cases infection is added to the cystic degeneration, and that is where the real danger comes in. I feel with Dr. Polak that many of the patients have less symptoms at the menopause if one conserves the ovary but there is this danger of infection in the conserved ovary and serious complications may follow the subsequent operative procedure.

DR. H. C. COE.—Some interesting physiologic facts have been brought to my attention in a number of patients on whom I operated ten or fifteen years ago. They were entirely relieved of their symptoms for a year or two and they gave the curious history of delayed menopause symptoms for three, four or five years after operation. I question at this time whether the ovaries which previously had not been degenerated, underwent entire atrophy.

DR. JOSEPH BRETTAUER.—This question has been discussed before this Society repeatedly and always with the same result—some for and some against. I agree with Dr. Polak that the question of removing ovaries in a rat or rabbit or dog, and the question of removing ovaries in a human female, are two entirely different propositions, and you cannot make any deductions from one and apply them to the other. The results which Dr. Kross obtained in a limited number of experiments may be all right in rats, but I am not willing to accept them for the human female.

Some ten or twelve years ago I had two series of operations going on for fibroids. I collected 25 perfectly uncomplicated fibroids in which I removed both appendages, and 25 in which I left both appendages, and the after results so far as I could judge, were practically the same in both series. At that time I stated and again repeat that while the number of observations was small, I

would be inclined to remove both ovaries whenever operating for uncomplicated fibroids. I do not operate on this type of case however in a woman under forty, unless there is an absolute indication.

This is the salient point I make again; conservatism before operation. You must differentiate between leaving adnexa in cases operated upon for inflammatory disease, and in cases operated upon for neoplasm. You may find normal ovaries in a case where both tubes are tightly adherent down in the pelvis, and you will leave the pelvis raw and cannot cover it with peritoneum. There is oozing, and the best procedure, to my mind, for the safety of the woman, is to remove the ovaries, because within twenty-four hours they become adherent and are a source of trouble in the future.

Since we are discussing the subject I would like to hear from some of the members who have adopted the method of transplanting some part of an ovary into the abdominal wall after completing the intra-abdominal operation, as advocated by English gynecologists.

DR. KROSS (closing).—I would like to repeat briefly some of the results obtained by Keitler in the work which he has done in hysterectomies. He took a number of cadavers and went through the technic of a hysterectomy in order to test out the possibility of the conservation of the blood supply and he found after doing a hysterectomy, by injecting the blood vessels, that there would be so much spurting through the severed blood vessels that he would have to ligate them and thus interfere with the circulation of the ovary. To obviate this he left in a sliver of the lateral wall of the uterus in an attempt not to interfere with the ascending branch of the uterine artery and the anastomosis between the uterine and the tubo-ovarian arteries and he found even by doing that that he would have spurting, thus necessitating tying off of the blood vessels. He repeated that experiment on several cadavers.

In regard to the menopause symptoms, I would state that Schickele collected a very large series of cases and found that in the normal cases there were menopause symptoms which were practically as severe as in a large series of cases that had been operated on with conservation of the ovaries.

In reference to the benefits and advantages to be gained by conserving the ovaries for even a period of two or three years, I would say that one must place on the other side of the balance sheet the dangers of degeneration, infection and subsequent operations. Dr. Polak in his cases has had 24 per cent of secondary operations, and in all those cases every possible attempt was made to conserve the blood supply. Still 24 per cent of the cases required secondary operations.

I personally think, in view of the large number of secondary operations which must necessarily be done, that it is far wiser to prevent the possibility of having to perform a secondary operation rather than to give the patient the benefit of a few months of more or less doubtful freedom from menopausal symptoms and disturbances.

As far as transplantations are concerned, Graves, in human subjects, has had a number of unfortunate experiences in which he had to remove the transplanted ovary from the abdominal wall. In transplanting the ovary experimentally I have found even with the use of autografts that in the great majority of cases the ovaries have undergone distinct cystic degeneration. In fact, Tuffier, who, I think, has had the greatest experience in transplantation of the ovaries, claims that a transplanted ovary in the absence of a uterus is practically valueless.

# Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

## Collective Review

### Modern Gynecology and Its Trend Towards Conservative Measures\*

BY ROBERT T. FRANK, A.M., M.D., F.A.C.S., DENVER, COLO.

THE gynecology of today is turning more and more toward non-operative methods. This is due in part to the epoch-making discovery of the effects of radio activity, but even more so to a growing dissatisfaction with the functional results of many operations formerly classed as successful. In order to comprehend the full significance of this change, it is necessary to review the development and growth of gynecology and abdominal surgery.

*The formative period* of operative gynecology, to a great degree, took place in the United States, and as Garrison says in his "Introduction to the History of Medicine,"<sup>1</sup> at least in part had its origin in the attempt to repair the errors and omissions of backwoods obstetrics. In the early days, only the gravest or most incapacitating lesions were attacked.

Only a few of the most important achievements of American gynecologists can be mentioned here. McDowell in 1809 with matchless ingenuity and boldness successfully removed a huge ovarian cyst.<sup>2</sup> Nathan Smith, of Vermont, and the Atlees in Philadelphia followed in his footsteps. In 1844 Washington Atlee performed a myomectomy. In 1852 J. Marion Sims then of South Carolina, after thirteen unsuccessful attempts upon the same patient, devised a method of cure for a hitherto incurable disease, vesicovaginal fistula.<sup>3</sup>

Thomas Addis Emmet of Virginia, laid the foundation of plastic repair of the cervix in the sixties.<sup>4</sup> In 1872 Noeggerath, of New York, published his observations on the importance of latent gonorrhea.<sup>5</sup> In the same year Battey of Georgia advocated the excision of the ovaries for nonovarian troubles such as dysmenorrhea and neuroses.<sup>6</sup> In the late seventies, John S. Parry described extrauterine pregnancy. Bozeman of Alabama irrigated the kidney pelvis through the ureters for pyelitis by means of an operatively induced vesicovaginal fistula. Howard Kelly not only simplified this method by the use of his direct cystoscope, but also greatly improved the technic of other kidney operations. John Byrne of Brooklyn successfully removed the cancerous cervix with the cautery and Ries of Chicago fathered the radical removal of the cancerous uterus together with the regional lymphatic glands by means of the modern operation, often called Wertheim's, because this operator stood as its chief exponent.

Until the introduction, acceptance and wide dissemination of Listerian

\*Read before the Denver County Medical Society, March 21, 1922.

methods of antiseptis and asepsis, all operations, and especially such as necessitated the invasion of the peritoneal cavity, were hazardous and uncertain. In consequence, surgical practice was concentrated in the hands of a comparatively few bold and skilful men. Some of these operators became marvellously adept. The high mortality rate incident especially to laparotomy, however, acted as a wholesome check and caused even the master surgeons to rigidly refrain from unnecessary interference.

*The Period of Asepsis.*—Asepsis, in the later decades of the last century, greatly reduced the danger of peritoneal infection.<sup>7</sup> Improvements in methods of anesthesia, technical advances in every direction, reduced the operative mortality to the vanishing point. As a result of this, surgery was rapidly popularized and widely diffused. The laity lost its fear of operation, and the physician no longer waited for grave conditions to develop, but often interfered early or even prophylactically, as for example in removing a but slightly diseased or normal appendix. Exploratory operations, with all their advantages, as for instance the discovery of malignancy in its veriest incipency, but with the serious disadvantage of encouraging carelessness in diagnosis, were generally adopted. It was no longer regarded as essential to undergo a long apprenticeship in surgery, if due attention was paid to aseptic technic. Every town and every hamlet throughout the civilized world now boasts of at least one medical man, who can meet surgical emergencies with a greater degree of success than the masters of their craft could do in 1850.

The period extending from 1875-1910, let us say, was thus marked by the popularization of surgery and with it of gynecology. Except in the large university clinics, here and abroad, most men practiced both surgery and gynecology, often without any special training in the closely related branch of obstetrics. Although the advances, and acquirements in gynecology have most often been made by trained gynecologists, their adoption and use more often has fallen to the general surgeon. The result has been an ever increasing number of operations, some necessary, some unnecessary; some successful, some unsuccessful; some upon the right patient, others upon the wrong one. Gynecology has been by no means free of the "crazes" which have marked various periods of medicine.

It is wholesome to take stock of some of these crazes which have swept along the unthinking in times gone by, just as they carry them along today. For there is usually some germ of truth, a valuable kernel hidden somewhere, in each of these seeming aberrations. A few examples will suffice. At one time, before the operative era had developed, every ill that woman was heir to was ascribed to displacements of the uterus. These troubles according to Graily Hewitt, Velpeau, Hodge and others could be cured by the pessary. Today some of our younger colleagues, I am sorry to say, have gone to the opposite extreme and have forgotten the value of the pessary, a most useful instrument, which may tide a woman over her years of child-bearing, or save an old decrepit patient from the dangers of a reparative operation. The "Battey" craze, which consisted in castrating women for every possible condition, sterility excepted, is an example of "crowd hysteria" rarely equalled in the annals of medicine. Reputable surgeons would appear at medical gath-

erings proudly exhibiting quart-sized mason jars filled with human ovaries.

One of the least justified crazes I can myself dimly recall toward its end, Apostoli's intrauterine faradization for uterine fibroids. The method was not even harmless, infection of submucous growths not infrequently resulting from the manipulation.

A craze now well on the wane is the one based on the theory that sterility in women is mainly due to a mechanical stenosis of the cervix. Hence dilatation and discission, splitting of the cervix, plastic operations on the cervix, or the stem pessary were used indiscriminately. Today we are beginning to see that most of our successes, for striking results were obtained in some instances, were due to temporary or permanent drainage of an inflamed cervical canal.

The craze of today is based on the theory that all diseases result from disturbance of the ductless glands. This theory too harbors more than a modicum of truth and value. We may be in a position to justly evaluate it ten years from today, when the wheat has been sifted from the chaff.

Careful follow-up methods have shown that the surgeon who brashly boasted that his operations for hernia were never followed by recurrence, that his vaginal plastic work was invariably successful, that his radical removal of diseased adnexa relieved all patients of their pains and aches, was either mistaken or wilfully misrepresented results. We can largely thank Codman of Boston for insisting upon our taking stock. The American College of Surgeons, by demanding routine examination of all material removed at operation, has also added another wholesome check upon reckless and unnecessary interferences. It has thus become evident that many operations though well executed and technically perfect, do not accomplish what they are supposed to or reputed to do.

Thus curettage does not cure the leucorrhœa, backache and profuse bleeding of "endometritis," largely because these symptoms may be respectively due to cervical infection, to sacroiliac or other joint strain, or to ovarian disease.

The treatment of acute pelvic infections by surgical methods, except the evacuations of pus accumulations, has been generally abandoned, because in the acute stage, if radical operation is unavoidable, the operative mortality is increased and the residual exudates produce protracted invalidism.

The radical operation for cancer of the uterus, in spite of saving many a life, is disappointing. Of all patients suffering from cancer of the uterine cervix only about half, when first seen by the surgeon, can still be subjected to operation. In the best of hands only one woman out of five can be cured.

Formerly it was the invariable custom to curet the uterus for septic abortion, for retained secundines postpartum, for puerperal sepsis. Today this barbarous practice has been generally abandoned, with the result that many women who were doomed by meddling surgery recover spontaneously.

Not only have physicians become more analytical of their results, the public too has grown skeptical. Patients are no longer satisfied to escape with their lives. The more intelligent also demand to be relieved of their suffering. If in spite of operation no relief is obtained, the



patient may seek aid from Christian Science, chiropractics or some other cult. Moreover he proselytes his friends, who follow in his wake. Victims of misapplied surgery largely help to swell the ranks of the various "pathies," "practics" and "antis" of today. These hordes are a menace to the community, because they prevent the enactment of hygienic measures such as compulsory vaccination laws, because they compel the legislatures to admit unqualified sectarians to practice medicine, and because they advocate measures which hamper research.

*The present era*, just dawning, shows a healthy reaction toward conservation. The "consigne" of today is *functional restoration*. Not only the pathologist but also the physiologist and chemist are called in consultation. Various physical therapeutic methods have been resuscitated and adopted. The new serology has been called to our aid. As in other fields of medicine the refinements of diagnosis, which have been added to our armamentarium, help to avoid unnecessary operation.

It is feasible in this article to touch only upon a few of the more important changes in practice.

*Radiotherapy* is one of the greatest aids to the modern gynecologists. The x-ray enables him to control, by moderating or entirely abolishing ovarian function, functional uterine bleedings, so common around the menopause and puberty. Of the 50 per cent of uterine fibroids which require any treatment, from 10 to 25 per cent can be rendered innocuous by the Roentgen ray. This is of greatest advantage in patients who because of heart, pulmonary, or kidney disease, are poor operative risks.

The combined use of radium and x-ray in cervical cancer has already revolutionized the treatment of this fatal disease. Such masters of operative technic as Döderlein of Munich and Bumm of Berlin have abandoned the scalpel in favor of the ray. I personally, will resort to operation only in very early cases, and, even in these, prefer to give preliminary radiation. Sarcoma of the uterus is even more amenable to radiotherapy than carcinoma. It should not be forgotten that diagnosis in the early stages, as well as the early institution of treatment, is as essential today as heretofore.

*The treatment of pelvic inflammations* is now definitely nonoperative until full chronicity has been reached. This signifies that such measures as prolonged rest, parenteral exhibition of foreign protein (typhoid vaccine, caseine, turpentine fixation abscess) and application of high degrees of heat (dry air up to 250°-300° F.) are used, respectively, to localize the process, to increase the resistance of the body, and to favor absorption of inflammatory products.<sup>8</sup> When accumulations of pus occur, they are evacuated per vaginam or extraperitoneally above Poupert's ligament. Chronic pus tubes, which resist these measures, are eventually extirpated. Disability, due to adhesions or persistent exudate, responds well to dry heat, to massage, and to stretching by means of the colpeurynter weighted with mercury. Plastic operations on the tubes, performed with the expectation of restoring fertility, have proved disappointing.

Tuberculosis of the genitals and peritoneum appears to respond more certainly to hygienic measures and to heliotherapy than to radical removal. Exceptions to this are unencapsulated, serous types of tuberculous peritonitis, in which the fallopian tubes and the appendix, if tuberculous, should be excised at the time the fluid is evacuated, and massive

tuberculous pus tubes in patients with only latent pulmonary trouble.

The aim, therefore, in all types of pelvic inflammation, is to refrain from operation unless the disease fails to respond to prolonged application of conservative treatment. But if operation is performed, radical extirpation is indicated. The excuse for operation, frequently advanced, is that women of the working class cannot afford the loss of time necessary for treatment, that prolonged invalidism is a luxury of the rich. Only too often, however, operation is *followed* by prolonged invalidism.

Even greater conservatism is now applicable in *puerperal infections* since convincing evidence has been produced that Nature can wall off and overcome infective processes. That much misused instrument, the curet, is again being relegated to the purpose for which it was reinvented, namely to extract suspect particles from the interior of the uterus for examination by the pathologist. Hysterectomy for puerperal infections and ligation of the pelvic veins are now rarely performed.

The cause of a number of minor ailments was formerly ascribed to "endometritis" and treated empirically. Today much research has been devoted to discover the basic causes and to devise proper measures for relief. Chief among these ailments are leucorrhea, backache and a feeling of weakness.

Leucorrhea, or chronic vaginal discharge, may be due to gonorrheal, colon bacillus or other infection, most often cervical in origin. Marked anemia or severe systemic disease, by changing the substrat of the vaginal flora, may cause annoying discharges. The cause, in a given case, must be determined. *Uterine curettage rarely if ever cures a leucorrhea.*

*Backache*, in a small number of cases, is due to retroflexion of the uterus when the malplaced organ is engorged or adherent. In a certain number of women retroflexion is congenital and produces no symptoms.

As in men, backache is usually of static origin, or a part symptom of general enteroptosis. Proper shoes, proper posture, proper corset are more often curative than some operations for displacement of the uterus.

*Repair of cervical lacerations* is indicated only if the cervix is inflamed, produces too much secretion, or repeatedly causes abortion. The bogey of the lacerated cervix as a starting place for cancer has been much overworked. Relaxation of the vaginal outlet, unless accompanied by a marked degree of cystocele, rectocele or descent of the uterus, requires no treatment during the childbearing period. Much more reparative work is being done than is really needed.

Ovarian tumors, however, because of their potential malignancy, should as a rule be removed as soon as their presence is ascertained, before they have had time to become adherent, or, if malignant, to cause metastases.

With the exceptions of ovarian growths, therefore, operative treatment is less often called for than formerly. Emergencies such as excessive uterine bleeding from abortion or submucous tumor, an ovarian growth with twisted pedicle, a ruptured extrauterine pregnancy, a foudroyant appendicitis, today, as heretofore, require immediate surgical intervention.

I have sought to show that accuracy in diagnosis, rigid selection of cases, a sound grounding in the pathology of gynecological ailments, and the use of a few new therapeutic measures should reduce the indications for operative intervention, and yet increase the functional cures.

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MAJESTIC BUILDING.

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## Selected Abstracts

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### Toxemia of Pregnancy

McIlroy, A. Louise: Some Observations on the Investigation of the Toxemias of Pregnancy. British Medical Journal, March 4, 1922, No. 3192, 335.

The author stresses the importance of antenatal supervision relative to toxemias and also gives an outline of a scheme for the investigation of the toxemias of pregnancy. The pregnancy cases are registered in the out-patient department. Those presenting symptoms of toxemia are admitted to hospital wards for further investigation and treatment. Close examination of the urine in pregnancy is of the greatest importance. Blood examination is also of great importance. Bacteriologic examinations relative to toxemias have given little information. The general principles of treatment are rest; protein-free diet; careful attention to teeth; removal of oral infection; abundance of fluids and alkalis. Interruption of pregnancy is an acknowledgment of therapeutic failure. The conclusions are as follows: Severe conditions are preventable by proper supervision. There should be an adequate number of antenatal beds in maternity hospitals. Research along these lines should be stimulated.

F. L. ADAIR.

Mackenzie Wallis: The Toxemias of Pregnancy, with Special Reference to the Value of Certain Renal Function Tests in Diagnosis. The Journal of Obstetrics and Gynecology of the British Empire, 1921, xxviii, 3.

The author has succeeded in establishing several diagnostic tests of value in differentiating the toxemias of pregnancy from nephritis. The methods are

given in excellent detail. Four tests, the diastase content of the urine, the urea content of the blood, the urea concentration test and the ratio of albumen to globulin in the urine are found to be of value.

The increased ability of the urine to digest starch due to an increase in the elimination of diastase, was found to be the earliest sign of the onset of toxemia. Both the toxic vomiting and the eclamptic cases bore this out. In contradistinction, the kidney of nephritis shows a decreased ability to eliminate diastase and the blood concentration of ferment is increased, the urine concentration decreased. Since the first change in the kidney in eclampsia is a swelling of the capillary walls in the glomeruli, it is assumed that the increased diastase elimination and the appearance of globulin in the urine are due to this pathology. In nephritis, damage to the renal epithelium accounts for the decreased diastase elimination.

The urea content of the blood in the true toxemias was invariably within the limits of normal 0.02 to 0.05 gm. per cent, while diminished renal function as present in nephritis gave high concentrations. The excess of urea was of no prognostic significance as regards threatened uremia. It was of prognostic value in the convalescence. The urea concentration test of MacLean is of value in the nephritic cases. After the ingestion of fifteen gm. of urea the percentage in the urine at the end of one hour should be two per cent. One and one-half per cent indicates moderate kidney damage, one per cent, severe. These low concentrations were not found in eclampsia.

The author found that the urine of eclamptics contained a relatively greater amount of globulin than did the urine of nephritics. The proportion of albumen to globulin in eclampsia was 2 to 1, in nephritis 6 to 1. As this test is complicated, for clinical purposes a simple method is used. It consists apparently of the comparison of the simple heat test for albumen with the precipitation of globulin when dilute acetic acid is added to urine.

In none of the toxemias of pregnancy was any evidence of hyperglycemia or glycosuria found. This is definite evidence against the ductless gland theory of origin for toxemia. The author suggests that the investigation of every suspected case of toxemia begin with the examination of a fresh specimen of urine for albumen, globulin, casts, and the diastase content. The latter he considers the most valuable single test for this condition.

H. W. SHUTTER.

**Williams: Increased Amount of Uric Acid in the Blood in the Toxemias of Pregnancy.** *Journal American Medical Association*, 1921, lxxvi, 1297.

Compared with normal pregnant women, Williams found a marked increase in the amount of uric acid contained in the blood of women suffering from eclampsia, preeclamptic toxemia and hyperemesis gravidarum. Even in those women in whom the only symptom was a high blood pressure, an increase in uric acid was found. He thinks that toxic vomiting of pregnancy may thus be differentiated from vomiting of nervous origin.

R. E. WOBUS.

**Hirst, B. C.: The Etiology and Treatment of Eclampsia.** *New York Medical Journal*, 1921, cxiv, 377.

The author considers briefly the numerous theories of the etiology of eclampsia. He believes that eclampsia is a toxemia, and that the origin of the toxins is mainly in the fetal body—to a less degree in the placenta. Fetal excretory products throw a considerable burden on the mother's eliminative organs; when these are further overburdened by a heavy proteid diet, an inactive skin and

sluggish bowels, a breakdown is likely to occur. In carefully controlled patients, the incidence of eclampsia may be reduced to a minimum by antenatal care, including a diet light in proteins, preservation of normal skin action and regulation of the bowels. In treating eclampsia, the author combines eliminative measures with sedatives and means to reduce the blood pressure. Diaphoresis and catharsis are supplemented by gastric and colon lavage. Fluid is supplied by proctoclysis. Morphine is used only when the convulsions are violent and frequent and is considered harmful in a comatose patient with convulsions only at long intervals. High blood pressure is combated by veratrum viride, routine venesection of 16 ounces when the systolic pressure is over 180, and puncture of the membranes if the woman is undelivered. Operative treatment by cesarean section is reserved for cases in which these methods have been carried out without progress in labor and without improvement.

Eighty-nine cases treated in five years had a maternal mortality of 21.3 per cent and infant mortality of 36 per cent. Fourteen cesarean sections showed a maternal mortality of 14 per cent, an infant mortality of 34 per cent. Five cases were cured without delivery.

MARGARET SCHULZE.

**Moore: Puerperal Eclampsia.** Journal of Indiana State Medical Association, 1921, xiv, 305.

The author notes that practically no two writers agree as to the cause of eclampsia and discusses only the most widely advocated theories. Renal insufficiency does not seem to be the sole cause because many cases with albuminuria and high blood pressure do not develop eclampsia. There are no significant kidney lesions at autopsy, and many cases of renal insufficiency do not develop convulsions. The urea disturbance appears to be more of a liver than a kidney insufficiency. There is evidence that oxidation in the entire body is decreased. Theories attributing the toxicity to the fetus are without definite proof. The same holds true of theories concerning the placenta. If these add to the toxicity it is perhaps due to the adding of excessive products of metabolism to the maternal blood. Theories concerning the ductless glands are speculative with some points in their favor.

The author doubts if there is any specific poison present in eclampsia, but rather believes that it is due to faulty elimination by all the excretory organs, first the bowels, second the kidneys, third the skin. The nervous reaction of the individual patient towards the products of metabolism must be considered. This would account for those cases of high blood pressure, etc., who do not have eclampsia. The author believes eclampsia preventable except in presence of chronic Bright's disease. The treatment is advocated as first, preventative; second, palliative; and third, curative. The author's treatment is outlined.

W. K. FOSTER.

**Paramore: Eclampsia and Its Incidence.** The Lancet, 1921, cci, 1147.

The author's conception is that maternal visceral lesions found in eclamptics explain the toxemia, that the visceral lesions, precede eclampsia and are not merely terminal events.

He believes the toxemia which ends in eclampsia is simply an aberration of normal metabolism and eclampsia simply a uremia distinguishable from other acute uremias only in the method of its production. In his opinion the maternal kidney and liver lesions are due to an ischemia, a necrosis due to the shutting off of the blood supply by pressure. The pressure is an exaggerated intraabdominal pressure produced in certain cases of pregnancy.

Mention is made of experiments which prove the increase in intraabdominal pressure. The fact that eclampsia occurs far more frequently in primiparae, in cases of multiple pregnancy and hydramnios is also discussed.

Postpartum eclampsia he believes, must be attributed to the effects of labor on viscera prone to such disease.

NORMAN F. MILLER.

**Mack:** *Hyperemesis Gravidarum.* Zeitschrift für Geburtshilfe und Gynäkologie, 1920, lxxxiii, 27.

The author gives an extensive discussion of the numerous theories of the etiology of this disease, grouping them into those of reflex neurosis, functional neurosis, intoxication and bacterial infection. His personal conclusion from a study of 50 cases occurring in the Giessener clinic during a period of 15 years is that it is a maternal intoxication caused by the ovum. An hysterical tendency may be a predisposing or additional cause. Treatment should be carried out in a hospital, with complete rest in bed, proctoclysis with Ringer's solution and bromides. Teaspoonful doses of iced milk are gradually increased as tolerated, then eggs and "zwieback", later gruels. If no improvement, normal pregnant serum may be used. Psychic control of the patient is most important. Therapeutic abortion should not be too long delayed in the severe and progressive cases. If the general condition grows worse and in addition to acetone and diacetic acid in the urine, pulse and temperature rise and the sensorium becomes clouded, the pregnancy should be terminated. Vaginal hysterotomy is the best, since it is the most rapid, method of abortion.

MARGARET SCHULZE.

**Hurst:** *The Hysterical Nature of the So-called Pernicious Vomiting of Pregnancy.* The Lancet, 1922, ccii, 528.

The author is of the opinion that pernicious vomiting of pregnancy is always hysterical except where associated with eclampsia and acute yellow atrophy. He believes the condition curable by properly applied psychotherapy.

He reports two cases both presenting the clinical picture of a severe pernicious vomiting. Both had a very high ammonia coefficient. By the use of psychotherapy the condition in these cases was cured.

Hurst is of the opinion that the high ammonia coefficient and excess of diacetic acid is due to starvation rather than a toxemia. These findings do not occur in starvation where fluids have been liberally taken.

NORMAN F. MILLER.

**Falk:** *A Further Contribution to Hypnotism in Obstetrics and Gynecology.* Zentralblatt für Gynäkologie, 1922, xlv, 658.

Falk adds to the testimony of Schultze-Rhönhof as to the value of hypnotism in obstetrics and gynecology. While the former dealt largely with the results at the time of labor, Falk instances remarkable results in other fields, notably seven cases of severe hyperemesis gravidarum, two of which had been sent to the clinic for the termination of pregnancy. Only one was refractory; the other six were completely healed by suggestion, the most severe case showing the promptest recovery. This was a twenty-six year old, third-para, in the third month of pregnancy. She was in a very serious state, having vomited from the first day of the pregnancy. After one treatment she was improved, and within a few days had recovered her appetite and was free from nausea. The mental condition was also markedly improved. She is now within one month of her labor.

Likewise in dysmenorrhea most remarkable results are reported, 13 out of 16 cases being practically cured by suggestion.

Little is said of the technic of the treatment, but one case reported is of extreme interest. A twenty-year-old nullipara, with normal genitalia, had, since puberty, profuse menstruation and in the past two years, periods lasting 10 to 14 days. She was very anemic and suffered from headache. All the usual treatment had been tried without results. At the first sitting, in an interval between periods, she was hypnotized to complete amnesia, and it was impressed upon her that the periods would never last longer than three full days, and that, as soon as the three days were passed, the blood would be directed to the vessels of the limbs. This suggestion was repeated on three successive days, and the patient was instructed to return after the subsequent menstruation. She knew nothing of what had been said while she was under the hypnotic influence. A few days later she reported that the period had lasted but three days, and it is interesting that she then complained of severe pains in the limbs. Three subsequent menstruations have lasted only three days, and the headache has disappeared.

A further case, of sexual frigidity, was also reported as completely cured by suggestion under hypnosis.

LITTLE.

Liepmann and Schulz: Newer Results in Placenta and Eclampsia Research. *Deutsche Medizinische Wochenschrift*, 1921, xlvii, 1417.

In previous researches, Liepmann and his collaborators had demonstrated that the placenta contains both a glycolytic and a peptolytic ferment. They also found that placentas from eclamptic patients manifested a toxic action on rabbits not produced by normal placenta. Strangely enough, placenta from a patient who had numerous attacks of convulsion was less toxic than from one who had only one attack, as if the poison had already been spent in the former. By certain precipitins, these placental constituents were demonstrated in the patients' blood.

In the present work, solutions of dextrose and of casein as well as diluted cow's milk were dialized through fresh normal placentas at body temperature. In each case there occurred a retention of from 25 to 40 per cent within the placenta. In placentas, inactivated for two hours at 75° C., the retention was practically nil. In using placentas from eclamptic and pre-eclamptic patients, however, it was found that instead of being diminished as in the normal placenta, the amount of nitrogen transfused was actually increased, up to over 700 per cent, while the amount of sugar was diminished even to a greater extent than in normal placentas. This seemed to show that not only the transfused protein is digested in the placenta, but that, in addition, a variable amount of amino-acids and other nitrogen products are given off by the placenta itself, at any rate in the case of an abnormal placenta. Since the placenta thus appears to be the source of toxins in eclampsia, the authors are of the opinion that any form of treatment which does not include emptying the uterus, is illogical.

R. E. WOBUS.

Phillips: Acute Hepatic Toxemia Complicating Pregnancy and Labor. *Journal of Obstetrics and Gynecology of the British Empire*, 1921, xxviii, 124.

The chief infecting organism attacking the liver during pregnancy and labor is the colon bacillus, less common the staphylococcus and streptococcus. Five reported cases are considered to be infections of the liver. Two cases suggest the possibility of delayed chloroform poisoning, the pertinent symptoms not

appearing until after its use at delivery. One received the anesthetic over a period of eight hours. The three remaining cases conform more to a general type. The onset of symptoms was at or about the onset of labor. The findings were: nausea, vomiting (material frequently stained with old blood), jaundice, clay colored stools, biliurine, mental symptoms from early irritability to coma and a positive culture of colon bacilli in the urine. The author believes that the common attacks in pregnant women of malaise associated with muddy complexion, scarcely amounting to jaundice, are mild types of the same infection. Three of the cases recovered. Autopsy on one case showed a liver weighing 36 ounces. Microscopically the midzone of the liver lobule showed marked degenerative changes, the periphery was not markedly involved.

Chloroform was the anesthetic used in all the deliveries. Labor was induced in two cases because of disproportion. Attention is called to the difficulty of diagnosis between malignant jaundice, acute yellow atrophy and this group of ascending infections of the bile ducts. Treatment is directed to the upkeep of the body fluids and elimination.

H. W. SHUTTER.

**Harding:** Nausea and Vomiting in Pregnancy. *The Lancet*, 1921, cci, 327.

A little over two years ago Duncan and the author put forward the theory that the nausea and vomiting of early pregnancy was due to a deficiency of glycogen in the maternal liver. This deficiency being either absolute or relative, i. e., actually lower than normal in amount or lowered relatively to the fat requirement of the maternal and fetal organs. In their present paper they extend and amplify the contention of the previous report. Their work up to date is based on nearly two hundred cases which have been treated by carbohydrate feeding.

They believe that the primary etiologic factor in nausea and vomiting of pregnancy is a lack of glycogen in the liver of the mother. Intestinal intoxication and neurosis are mentioned as secondary factors.

In treating these cases it is advised that the glycogen supply of the maternal liver be kept as high as possible by means of a rich carbohydrate diet. It is also advised to reduce the amount of fat in the diet for some time. The feeding of a high carbohydrate diet is best accomplished by giving a series of small meals, five or six in number. Such diet, however, should not be continued too long. They believe that no fear need exist regarding any possible retardation or lack of fetal growth because of this treatment.

In the more severe cases where food cannot be taken by mouth they advocate the use of 10 per cent glucose solution per rectum, and occasionally if the condition indicates, one liter of sterile 5 per cent glucose solution made up with normal saline, intravenously. The glucose enemata should be continued in most cases until the urine becomes acetone free.

NORMAN F. MILLER.

**Titus and Givens:** Intravenous Injections of Glucose in Toxemia of Pregnancy. *Journal American Medical Association*, 1922, lxxviii, 92.

It has been assumed that the toxemia of pregnancy may be due to a deficiency of carbohydrates in the system and, more specifically, of glycogen in the liver. This is thought to lead directly to a degeneration of the liver parenchyma. In case of excessive vomiting, and the consequent starvation, this deficiency becomes more acute. Further, it has been shown that after carbohydrate starvation, an animal is more vulnerable to a variety of poisons. The work of Davis, Hall and Whipple has demonstrated that pathologic changes in the liver, produced



by almost fatal doses of poisons, disappear rapidly after the ingestion of carbohydrates. It is also pertinent that not only chloroform poisoning, but simple starvation as well, cause changes in the liver somewhat similar to those found in the toxemia of pregnancy.

Upon this theory, Titus and his associates have based as a logical treatment of the toxemia of pregnancy, the ingestion of an abundance of carbohydrates. In the milder cases, this is done by feeding the patient frequently on a diet rich in sugars. In the more severe cases, they have injected a solution of glucose directly into the bloodstream with rather uniformly beneficial result. In the cases of eclampsia, they have reduced their mortality to one-half of what it was under the recognized conservative treatment. They think that the livers of patients who had been treated by glucose injections, but died in spite of this treatment, showed definite reparative changes. The kidney changes, which, of course, are not affected by this treatment and may be the ultimate cause of death, are thought, by these authors, to be secondary, resulting from the liver changes.

The dose has been gradually increased so that at present they inject from 50 to 75 gms. of glucose dissolved in from 250 to 500 c.c. of water. The dose is repeated after the sugar has been stored, as determined by blood sugar determinations.

R. E. WOBUS.

**Paddock: Treatment of Hyperemesis Gravidarum by the Duodenal Tube.** *Journal American Medical Association*, 1922, lxxviii, 1611.

Paddock believes that by feeding through the duodenal tube in severe cases of the vomiting of pregnancy we can avoid emptying the uterus in order to give relief. He begins by feeding glucose solution by the drop method a few hours after passing the tube. When the tube has settled in place, he gives feedings of glucose solution, milk, water and such medicaments as bromides. It takes from 4 to 24 hours for the tube to enter the duodenum. After this, he claims, the treatment is easy. He also reports his third case successfully treated by this method.

R. E. WOBUS.

**Klots: Two Cases of Hyperemesis Gravidarum.** *Nederlandsch Tijdschrift voor Genceskunde*, 1921, ii, 2791.

A woman was brought in from the country on account of excessive vomiting. She was in the fifth month of her first pregnancy and had always been in good health until she became pregnant, since then she has been vomiting. On admission she was found to be greatly emaciated, her pulse was 130 and temperature 101.5. The urine contained albumin.

While her pulse improved slightly under hypodermic administration of digitalis, her general condition showed no improvement, so that an abortion was decided upon. Under general narcosis, the cervix was dilated with Hegar's dilators, with which it was very difficult to pass the internal os. While this was in progress, the patient suddenly stopped breathing, upon which the procedure was stopped. After 20 minutes, breathing was reestablished and the patient was put to bed. Much to the surprise of Klots, she forthwith got well and, in due time, was delivered of a healthy boy.

Eight months later Klots had a similar case, in which he used dilatation as a therapeutic measure. Again he found the internal os unyielding and again he had the same result, namely a healthy child at full term.

Klots admits that two cases do not prove anything but, since Copeman had

previously advised dilatation of the os internum for hyperemesis and since these two cases prove that the dilatation of the internal os does not necessarily produce abortion, he feels that this simple therapeutic measure is worthy of further trial in otherwise hopeless cases.

R. E. WOBUS.

**Vinson: Oesophageal Stricture Following the Vomiting of Pregnancy.** Surgery, Gynecology and Obstetrics, 1921, xxxiii, 412.

Spontaneous rupture of the esophagus following prolonged periods of vomiting are not unknown but Vinson finds no record of such accidents following the vomiting of pregnancy. He, therefore, describes six cases which presented themselves at the Mayo clinic on account of esophageal stricture which came on after protracted periods of vomiting during pregnancy. In most of the cases the dysphagia did not come on until some time after the vomiting had ceased but in several of the cases the probable injury was indicated by attacks of pain and the vomiting of blood or dark material.

R. E. WOBUS.

**Hügel: Treatment of Eclampsia with Strong Solution of Sugar.** Muenchener Medizinische Wochenschrift, 1921, lxxviii, 916.

In his earlier experimental work the author discovered that strong solutions of sugar retarded the coagulability of blood better than other crystalloid solutions without destruction of the blood corpuscles. Employing this fact he treated several cases of eclampsia both with and without convulsions with intravenous injection of 10 per cent glucose solution, and reports very favorably on its efficacy in relieving the symptoms. He uses it in conjunction with immediate emptying of the uterus. From 500 to 1000 c.c. of the 10 per cent solution are (very slowly) injected in the median vein at 36° C.

It is suggested that by employing a sugar diet during pregnancy the threatening eclampsia may be prevented from developing.

S. B. SOLHAUG.

**Davis: The Treatment of the Toxemia of Early and Late Pregnancy.** Journal American Medical Association, 1921, lxxvi, 1811.

Davis differentiates between the toxemia of early and late pregnancy. In early pregnancy, he assumes, chorionic and syncytial cells are freely discharged into the blood stream of the mother and her immunizing powers overwhelmed by this process while after the formation of the placenta, the pathologic process responsible for the toxemia, is located in the placenta itself. The nervous phenomena, he thinks, are due directly to a disturbance of digestion and assimilation.

In early pregnancy, he advises rest, both mental and physical, stomach lavage with warm sodium bicarbonate solution one to three times daily until vomiting ceases; bowel lavage with the same solution; warm sponge baths; woolen blankets; 5 per cent sodium bicarbonate and 5 per cent glucose are given, 4 to 6 oz. every 4 or 6 hours. The patient is allowed, however, to drink as much water—plain, saline or carbonated—as she desires. Retroversion, if present, is corrected, —if necessary, under ether narcosis. As the condition improves, food is allowed very gradually.

In the late cases, he begins with venesection and transfusion. He then irrigates the stomach, leaving from 1 to 2½ grs. calomel. The bowels are irrigated with hot sodium bicarbonate solution. He advocates dry heat to induce perspiration but deprecates wet packs. Morphine and atropine are used only if absolutely

necessary. Unless the woman is already in labor, he does not believe in emptying the uterus, as a rule. If, in multiparae, the cervix is partially dilated, he ruptures the membranes to expedite delivery, while in primigravidae threatened with convulsions, he frequently performs cesarean section.

In all cases, blood pressure, pulse rate and the chemical examination of urine and blood should be a guide to treatment and in all serious cases consultation should be sought.

R. E. WOBUS.

**Hirst, John C.: The Intravenous Use of Corpus Luteum Extract in Nausea of Pregnancy.** *Journal of American Medical Association*, 1920, lxxv, No. 12, p. 772.

Hirst believes that the intravenous injection of corpus luteum is the ideal method of administration in the treatment of the nausea of pregnancy. He has used this method in many hundred cases for the last two years. The following reasons are advanced for the use of this method:—(1) Rapidity of absorption. (2) Possible and advisable to use a considerable larger dose than is possible with the intramuscular injection in which more than 1 c.c. causes considerable local reaction. (3) Each ampule contains only 0.2 gm. of the extract and in this way the necessary total quantity can be introduced more easily and quickly. (4) There is no local reaction or discomfort of any kind after the injection. (5) The vomiting is often promptly controlled in cases in which the intramuscular use has failed. The dosage will vary depending upon the type of case under treatment. One patient aborted within 24 hours after the injection was given and this was the only one in whom abortion seemed to have resulted from the treatment. Hirst believes, however, that anaphylactic reactions need not be feared. The presence of goiter in early pregnancy absolutely contraindicates the administration of corpus luteum either intravenously or intramuscularly for the control of nausea. In his experience every such patient has been made much worse by this treatment.

C. O. MALAND.

**Cheinisse: Corpus Luteum Extract in Hyperemesis Gravidarum.** *La Presse Medicale*, April 16, 1921, p. 306.

The author points out that it is about fifteen years since M. G. Stella proposed the treatment of pernicious vomiting of pregnancy with ovarian extract. He says that in the last few years ovarian therapy has been taken up in the United States and France by more precise methods, namely, the injection of extract of corpus luteum. The intramuscular and intravenous use of the extract has given favorable results. It is usually productive of no harm but should not be used in cases having a goitre.

F. L. ADAIR.

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## Original Communications

### THE LIFE HISTORY OF OVARIAN HEMATOMAS (HEMORRHAGIC CYSTS) OF ENDOMETRIAL (MÜLLERIAN) TYPE\*

*(From the Gynecological and Pathological Departments of the Albany Hospital and  
the Albany Medical College.)*

BY JOHN A. SAMPSON, M.D., ALBANY, N. Y.

NEXT to leiomyoma of the uterus, the pathologic conditions arising from the implantation of epithelium which escapes from the fallopian tubes into the peritoneal cavity, probably furnish the most frequent pelvic lesions found at operation in women between the ages of thirty and the menopause. I have encountered thirty-seven cases with these lesions during the year, May 1, 1921, to May 1, 1922, in 170 abdominal operations for pelvic disease in women between thirty and fifty years of age (in over twenty per cent of these patients); and six additional cases, three under thirty years of age and three over fifty. One of the latter had not reached the menopause. The epithelium primarily giving rise to these implantations is derived from or through the fimbriated ends of the fallopian tubes. It lodges either on the surface of the ovaries or on the peritoneal surface of the other pelvic structures, especially those in the culdesac, or on both the ovaries and the pelvic peritoneum, and develops into glands or tubules (adenomas) of endometrial (müllerian) type. The primary peritoneal implantation adenomas are usually small and insignificant, but may spread and become invasive. The implantations on the ovary invade the tissues of that organ, and as a result of their reaction

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to menstruation develop into superficial or deep hematomas (hemorrhagic or menstruating cysts) of endometrial (müllerian) type, which usually perforate into the peritoneal cavity. Perforation occurs in the superficial ovarian hematomas while they are still small, a few millimeters in diameter. On the other hand, the hematomas developing in the deeper tissues of the ovary may attain a much larger size, from 1 to 9 cm. in diameter before perforation occurs. The material escaping from the perforation of the ovarian hematoma, whether the latter is small or large, may carry with it epithelium which is cast off from its lining by menstruation. This epithelium may give rise to secondary implantations which are often apparently more invasive, and have a wider distribution than the primary (original) pelvic implants. The ovary may be looked upon as an intermediary host in the development of implantation adenoma of müllerian type but not as an essential one. The implantation adenomas of uterine and tubal (müllerian) type in the ovary may also, possibly, be a source of ovarian cysts and carcinoma.

All implantation adenomas of endometrial (müllerian) type should be of great pathologic interest, as they are sometimes of great clinical importance. This is especially true of the ovarian hematomas of endometrial type and the implantations arising from their perforation. It is the life history of these ovarian hematomas which I wish to present in this communication.

In a paper entitled *Perforating Hemorrhagic (Chocolate) Cysts of the Ovary*,<sup>1</sup> presented at the last meeting of the American Gynecological Society (June 3, 1921), I reported twenty-three cases of ovarian hematomas of endometrial type. All these cases occurred in my own practice, and fourteen of them were observed during the previous year. The hematomas described in this series varied in size from 1 to 9 cm. in diameter, most of them being from 2 to 4 cm. They were bilateral in eight of the twenty-three cases. A perforation had occurred in all of the twenty-three cases and was found on the lateral, or on the free surface of the ovary. In all specimens the tubes were apparently patent. At the operation the cyst or ovary was found to be adherent, and in freeing it the "chocolate" like contents escaped because a previous perforation, which had become sealed by whatever structure the ovary had become adherent to, was reopened or the wall of the cyst was torn. Adhesions were present in all cases and these varied greatly in location and extent. They were found about the ovary at the site of the perforation, in the natural pockets and folds of the pelvis where material escaping from such a perforation would be apt to lodge, and especially in the culdesac. When slight, they simulated the adhesions resulting from a pelvic peritonitis of tubal origin; but the adhesions in the culdesac

were sometimes accompanied by such a marked reaction as to resemble malignancy. A histologic study was made of the tissue involved in the adhesions in fourteen of the twenty-three specimens and aden-

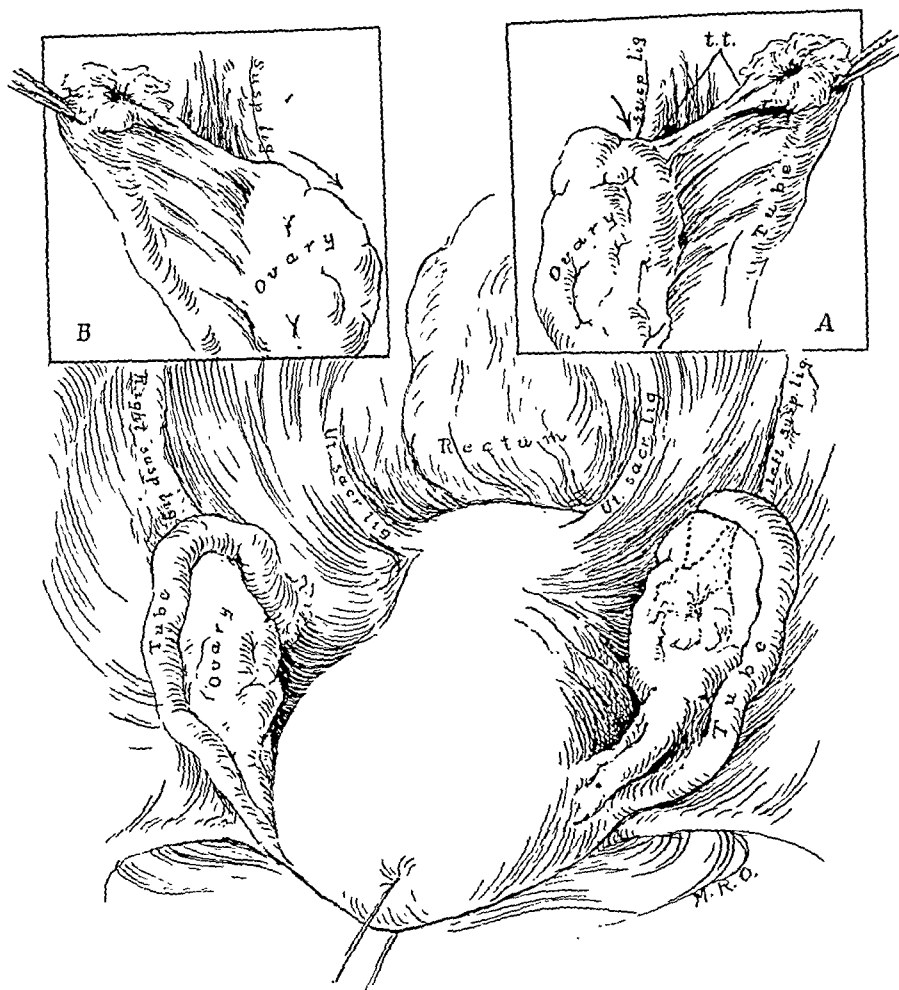


Fig. 1.—Two of the most frequent situations of the fimbriated ends of the normal fallopian tubes (x 5/6).

View of the pelvic contents as seen at operation: loops of the intestine lifted out of the pelvis, and the uterus drawn forward without disturbing the relation between the fimbriated ends of the tubes and the ovaries. The tube is usually longer than the distance from the cornu of the uterus to the distal pole of the ovary and, as the fimbriated end is freely movable, the latter is readily pushed into various situations by the contents of the pelvis. The distal pole of the ovary frequently projects beyond its attachment to the suspensory ligament in such a manner as to form a groove between it and the suspensory ligament (see arrow in insert A). The distal portion of the tube often slips into this groove and the fimbriated end of the tube is frequently situated beneath or lateral to the ovary, with its opening directed towards the surface of that organ by the "tether" like action of the free margin of the mesosalpinx (tubal tether, t.t.) to which the lower fimbriae of the tube are often attached. Should the distal pole of the ovary not project beyond the insertion of the suspensory ligament (see insert B) the fimbriated end of the tube slips down mesial to the ovary and is often tucked beneath that organ, the tubal "tether" (t.t.) directing the fimbriated opening towards the surface of the ovary. This mechanism of the "tubal tether" would facilitate the ovum's escape into the lumen of the tube in evulsion: this same close anatomical relation between the fimbriated end of the tube and the surface of the ovary would also permit epithelium, escaping from the fimbriated end of the tube or through its lumen, to become implanted on the surface of the ovary. The various physiologic changes in the pelvic contents would also cause the fimbriated end of the tube to brush against the structures in the culdesac. Should implantation adenoma arise from epithelium escaping from the tube, we should expect to find these implantations most frequently on the lateral and under surface of the ovaries, and on the posterior surface of the lower portions of the broad ligament, the uterus and in the bottom of the culdesac; especially about the uterine attachments of the uterosacral ligaments. It is in these situations that the early implantation adenomas are most often found.

oma of endometrial type was found in thirteen of these. I concluded that these ovarian hematomas were a source of many of the adenomas of endometrial type, so-called adenomyomas, found in the pelvis and not continuous with the mucosa of the uterine cavity. The adenomas in these thirteen cases could have arisen from the implantation of epithelium carried with the contents of the ovarian hematoma escaping through the perforation. They were compared with the peritoneal implantations arising from the perforation of a malignant ovarian cyst. I added: "I cannot state that these ovarian hematomas of endometrial type are the only cause of ectopic pelvic adenomas."

I have discarded the term "perforating hemorrhagic cysts" as applied to this condition, because perforations may occur in other varieties of ovarian hematomas. I now refer to them as hematomas or hemorrhagic cysts of endometrial (müllerian) type. Their epithelial lining, where present, is similar to that found in the hematomas due to the retention of "menstrual" blood which occur in the

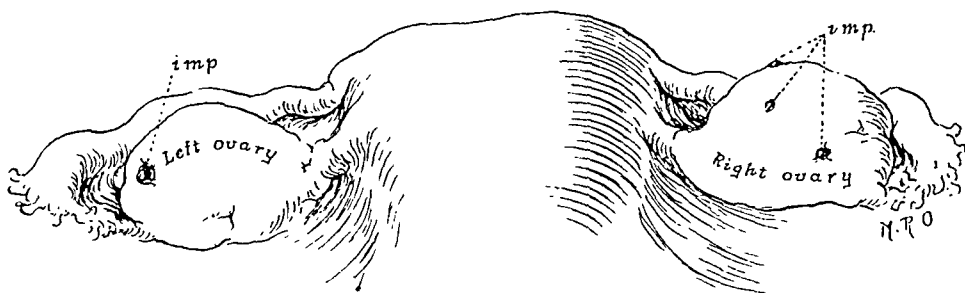


Fig. 2.—(Case 5). Implantation adenoma of endometrial type on the lateral surface of the left ovary, and the lateral and under surfaces of the right ovary. View of the posterior surface of the uterus and tubes, with the ovaries turned upwards, exposing their lateral surfaces ( $\times 4/5$ ). Implantation adenoma was found only on the surfaces of the ovaries as indicated. The lateral and under surfaces of the ovaries are the portions of the ovaries most frequently found in contact with the fimbriated extremities of the tubes (Fig. 1). The patient was menstruating the day of the operation, and the implantations appeared like miniature strawberries. For colored photomicrograph of a microscopic section of one of the adenomas shown on the surface of the right ovary, see Fig. 28. Fig. 29 shows a colored photomicrograph of a section through the adenoma on the surface of the left ovary.

adenomyomas of the uterus derived from the uterine mucosa, and the blood in the ovarian hematomas is also apparently of menstrual origin.

In the first communication I described small hemorrhagic areas in the ovaries of three patients who had been operated upon during their menstrual period. Histologically these areas proved to be due to hemorrhage about or into a space lined by tissue of endometrial (müllerian) type. I stated that I believed these gland-like spaces were lined by epithelium of endometrial type as shown by their structure and by their function (menstruation). I also stated that the ovarian hematomas described in that paper might have arisen from these endometrial-like structures. At the time the paper was sent to the Archives of Surgery for publication I had not been able completely to

trace the development of the ovarian hematomas of endometrial type from these structures, but during the month of August, 1921, I did so. A note was added to my paper as it appears in the Transactions of the American Gynecological Society stating that all the conditions found in the hematomas described in that paper had been traced from these endometrial-like glands which reacted to menstruation. It was also suggested in this note that the gland-like structures in the ovary, from which these hematomas develop, might arise from the implantation of epithelium derived from or escaping through the fallopian

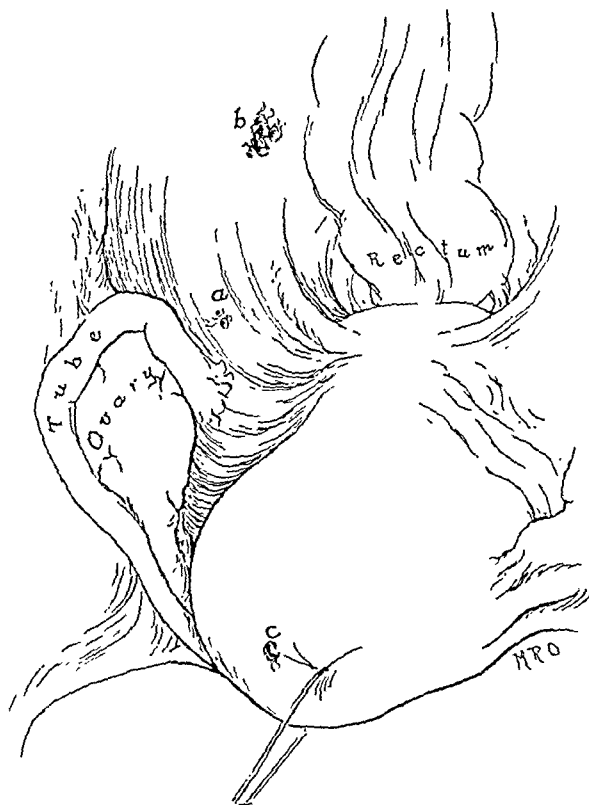


Fig. 3.—(Case 18). Implantation adenoma of endometrial type on the posterior surface of the lower portion of the right broad ligament, (a), the culdesac lateral to the rectum (b) and the posterior surface of the uterus (c). View of the pelvis from above with the uterus drawn upward (from sketch made at the operation,  $\times 5/6$ ). The uterus was retroflexed, and on drawing it forward these implantations were observed. On replacing the uterus in retroflexion it was noted that the adenoma (c) came in contact with adenoma (b) and I believe that it was probably a contact implantation from adenoma (b). I believe adenomas (a and b) arose from epithelium escaping from the right fallopian tube. For the gross appearance of the adenomas (in colors) see Figs. 17, 18, and 19, and for the histologic structure of adenoma (b) see Fig. 24. The patient was operated upon the day after menstruation had ceased.

tubes and that implantation adenoma in the pelvis might arise from this source as well as from the perforation of an ovarian hematoma.

At a meeting of the Interurban Surgical Society at Albany, N. Y., November 25, 1921, I presented the pathologic findings in twelve cases<sup>2</sup> in which portions of the intestinal tract were involved by implantation adenomas of endometrial type which could have arisen from epithelium escaping from a perforated ovarian hematoma. The



development of the hematomas from the gland-like structures of endometrial type in the ovary was also demonstrated at this meeting.

On February 14, 1922, before the Harvard Medical Society at Boston, Mass., I reviewed in a general way the entire subject of ovarian hematomas and implantation adenomas of endometrial type.<sup>3</sup> As stated at that meeting my interpretation of the origin and development of these implantation adenomas was as follows: Tubal and uterine epithelium at times escapes into the peritoneal cavity from or through the fimbriated end of the tube. It lodges where such material would be likely to fall, especially on the lateral surface of the

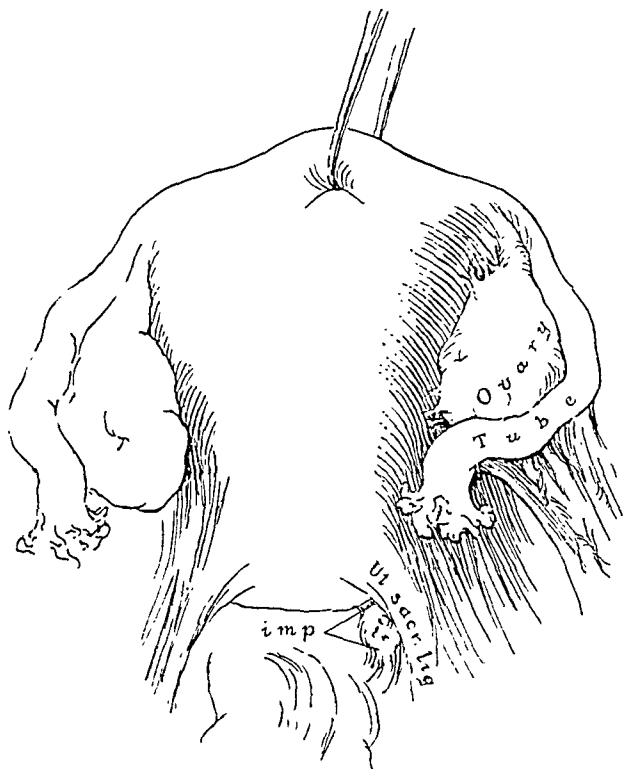


Fig. 4.—(Case 13). Implantation adenoma of endometrial type in the culdesac, mesial to the uterine attachment of the right utero-sacral ligament. View of the uterus, tubes and ovaries from above, uterus drawn upward and forward (from sketch made just after the operation,  $\times 5/6$ ). The uterus was retroflexed, and on drawing it forward a small hard nodule with pigmented dots on its surface was detected in the culdesac, as indicated. This was removed (see Fig 13). The right ovary was lightly adherent to the posterior surface of the uterus, broad ligament and the side of the pelvis. The ovary was freed and I was unable to detect any evidence of adenomas on its surface. The tubes were patent. I believe the adenoma in the culdesac could have arisen from epithelium escaping from the tube, although it might have arisen from a small hematoma of the ovary which had disappeared after perforation.

ovary, on its free border and in the culdesac, the distribution corresponding to the distribution of pus escaping from the fallopian tubes in salpingitis. Adenoma may develop wherever this epithelium falls on suitable "soil." We may, therefore, have implantations only on the ovary, especially on its lateral surface and free border, or both on the ovary and in the pelvis or in the pelvis alone. The tubules arising in the ovary may develop into hematomas which usu-

ally perforate and give rise to implantation adenomas, often apparently more invasive (virulent) and with a wider distribution than the implantations found without evidence of an ovarian hematoma. I consider the ovary as a sort of intermediary host, hot bed or incubator which sometimes imparts greater virulence to the epithelial cells developing in it, but it may not be an essential intermediary host in the origin of implantation adenomas of endometrial type. In this same communication the development of ovarian cysts and carcinoma from these tubules of endometrial type was also discussed.

I have used the term ovarian hematomas of endometrial type rather than endometrial hematomas because I believe that in some instances the epithelium lining them may possibly be derived primarily from the tubal mucosa. The term müllerian would be inclusive and a bet-

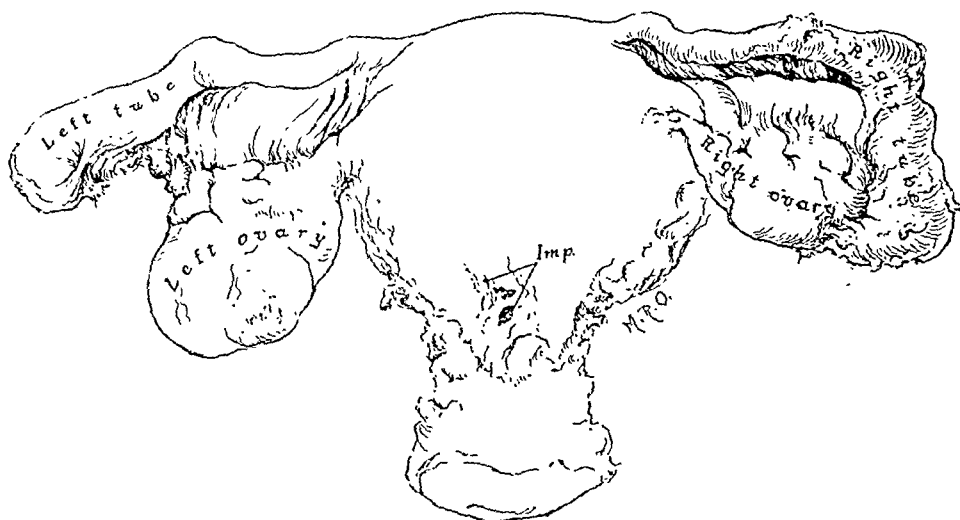


Fig. 5.—(Case 12). Implantation adenoma of endometrial type, of the posterior surface of the uterus (see also Figs. 12 and 20); bilateral hematosalpinx, adenoma formation in the fimbriated ends of both tubes, with extension of the tubal mucosa to the peritoneal surface of the distal ends of the tubes; leiomyoma of the uterus. Posterior view of the uterus, tubes and ovaries ( $\times 2/3$ ). Hemorrhage was found in the stroma of the walls of the dilated tubules of the adenoma of the tubes, and this indicated that the hematosalpinx arose from this source. The adenoma invading the posterior surface of the uterus was similar, in its histologic structure, to the glandular structures of the adenoma in the distal portion of the tube. (Figs. 11 and 12.) The situation of the adenoma of the posterior surface of the uterus and its structure indicate that it could have arisen from the implantation of epithelium escaping from the tube. Adenoma of endometrial type was not found in the ovaries.

ter one. Is it possible to decide whether a given implantation adenoma was primarily derived from tubal or uterine mucosa? I do not think it can be definitely proved in any instance but the histologic structure of some of these adenomas suggests a tubal, and others a uterine, origin.

Adenomyoma of the uterus and of the tube may be classified as either primary or secondary. In primary adenomyoma the adenomatous growth is derived from the direct invasion of the uterine or tubal wall by the mucosa lining their cavities. In the secondary type of growth, which in my experience is the much more frequent vari-

ety, the uterine or tubal wall is invaded by epithelium implanted on its peritoneal surface, which is derived from the perforation of an ovarian hematoma of endometrial type or from or through the fimbriated extremity of the tube. It is obviously possible that the epithelium giving rise to a secondary adenomyoma of the uterus might be derived primarily either from the tubal or the uterine mucosa, and the same is true of secondary adenomyoma of the tube.

A comparative microscopic study of primary adenomyoma of the tube and of the uterus demonstrates that there is frequently a very evident distinction between the two. The adenomatous growth derived from the tubal mucosa consists of tubules and dilated tubules lined by epithelium, usually without the characteristic stroma and glands found in normal endometrium; or if the latter are present they are insignificant as compared with the general histologic picture of

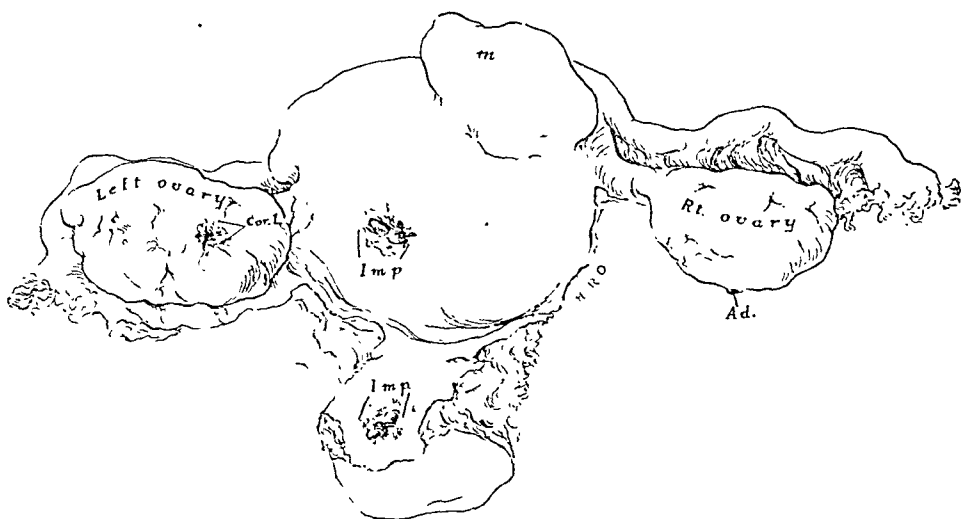


Fig. 6.—(Case 17). Implantation adenoma of endometrial type of the posterior surface of the uterus, the culdesac mesial to the left utero-sacral ligament, and the under surface of the right ovary; corpus luteum hematoma of the left ovary, multiple leiomyomas of the uterus. Posterior view of the uterus, tubes and ovaries ( $\times 2/3$ ). The uterus was retroflexed, and the adenoma on the posterior surface of the uterus was in contact with the one in the culdesac, and probably is a contact implantation from the latter (Fig. 14). It is possible that the adenoma involving the surface of the ovary (Fig. 15) may represent the remains of a small hemorrhagic cyst, which had perforated and lost the greater portion of its epithelial lining; and that the other implantations arose from epithelium escaping from this source. It is more likely that the ovarian and peritoneal implantations had a common origin from epithelium escaping from or through the tubes, which were patent.

the growth. In primary adenomyoma derived from the uterine mucosa the histologic picture is reversed, the prevailing type of growth resembles, with its stroma and gland formation, normal endometrium; while the tubules and dilated tubules so characteristic of a tubal adenoma are lacking or only form a small part of the entire growth. If only isolated areas are examined microscopically it may be impossible to distinguish between the two, but if the growth is studied as a whole the distinction is usually evident. A comparative study of the epithelium lining the uterus and the tube, apart from the under-

lying stroma, is of interest. The height of the epithelium lining a uterine gland usually varies with the dilatation of the gland; the greater the dilatation of the gland the lower the epithelium. The height of the uterine epithelium is usually more uniform than that of tubal epithelium, except in glandular hypertrophy, and even then there may not be as great a tendency for the formation of "tufts," which are due to a localized heaping up of epithelium with a subsequent increase in height as is so often seen in the ampulla of the tube. Cilia are usually more readily demonstrable on tubal than on uterine epithelium. Primary adenomyoma of the tube generally arises in the isthmus of the tube, where the epithelium more closely resembles that

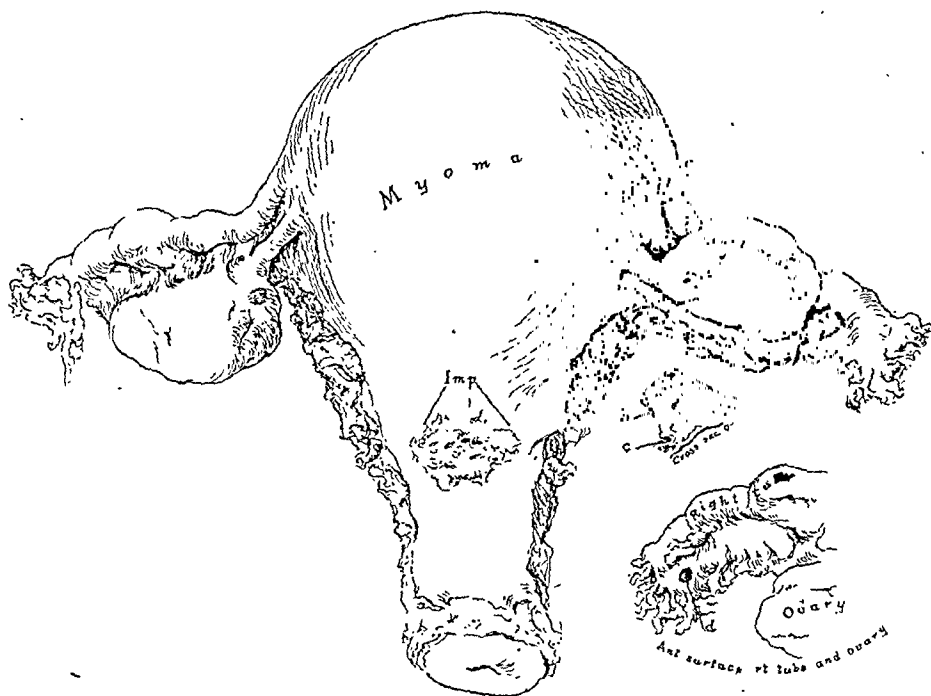


Fig. 7.—(Case 16). Implantation adenoma of endometrial type of the posterior surface of the uterus, lateral surface of the right ovary, and of the right fallopian tube near its fimbriated extremity; leiomyoma of the uterus. Posterior view of the uterus, tubes and ovaries ( $\times 1/2$ ). The adenoma (imp.) on the posterior surface of the uterus was situated at about the junction of the cervix and body of the uterus. The right ovary is turned upwards with its lateral surface exposed, showing the situation of the adenomas at (i). The adenomas on the surface of the ovary are also indicated by (b) and (c) of the cross section of the ovary, through the plane (a). The situation of the adenoma on the anterior or lateral surface of the right tube is indicated by (d) of the insert. Histologically the adenomas on the surface of the uterus, ovary (Fig. 16) and tube were similar, and I believe could have had a common origin from epithelium escaping from the right tube, as their distribution suggests.

of the endometrium than does the epithelium situated in the ampulla, but even in these adenomyomas we frequently find that the dilated tubules attempt to reproduce the structure of the mucosa of the tube, so that sometimes a careful microscopic study of the stained section may be required to distinguish the lumen of the tube from some of the dilated tubules in its wall. In the study of ectopic adenoma of possible endometrial or tubal type we must bear in mind normal endo-

metrium, glandular dilatations and hypertrophies, primary adenomyoma of the uterus, and especially the hematomas arising in these. We must likewise consider the normal tubal mucosa; that found in hydro- and hemato-salpinx and the structures in primary adenomyoma of the tube.

The first communication was based on the study of twenty-three cases of ovarian hematomas (hemorrhagic cysts) of endometrial type,

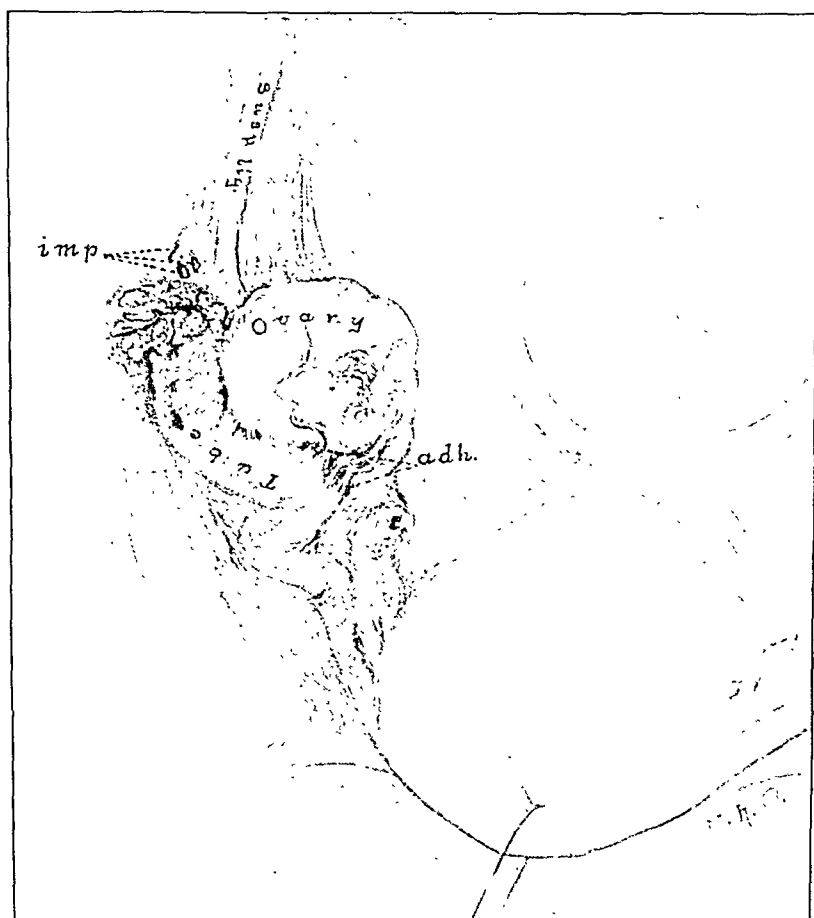


Fig. 8.—(Case 19). Implantation adenoma of endometrial type of the anterior surface of the suspensory ligament of the right ovary, and also of the mesial surface of the ovary near its attachment to the broad ligament; adhesions between the tube and ovary, uterus retroflexed. The condition found at operation is shown after replacing the uterus and drawing it forward, without disturbing the tube and ovary (from sketch made at the operation,  $\times 1$ ). As indicated, the tube was kinked, and adherent to the upper surface of the ovary in such a manner that the fimbriated extremity rested on the anterior surface of the suspensory ligament. An adenoma, histologically similar to the one shown in Fig. 16, was situated on the anterior surface of the suspensory ligament directly in front of the opening of the tube. Should epithelium escape from the tube, while in this situation, we should expect implantation adenoma to develop on the mesial rather than on the lateral surface of the ovary. Adenoma was found on the mesial, and not on the lateral surface of the ovary.

eight of which were bilateral. From May 1, 1921, to May 1, 1922, I have collected thirty-three additional cases of ovarian hematomas, all but three occurring in my own practice. Four of the thirty-three

specimens were removed prior to May 1, 1921, and had been previously preserved as doubtful specimens.

I have collected and studied fifteen cases of implantation adenoma in the pelvis in which the implantations were apparently of tubal (from or through) rather than of ovarian origin as will be discussed later.

The clinical histories of twenty cases are reported in the present paper and these were chosen from cases demonstrating the origin and development of the ovarian hematomas rather than from the more advanced ones with perforation and extensive implantations.

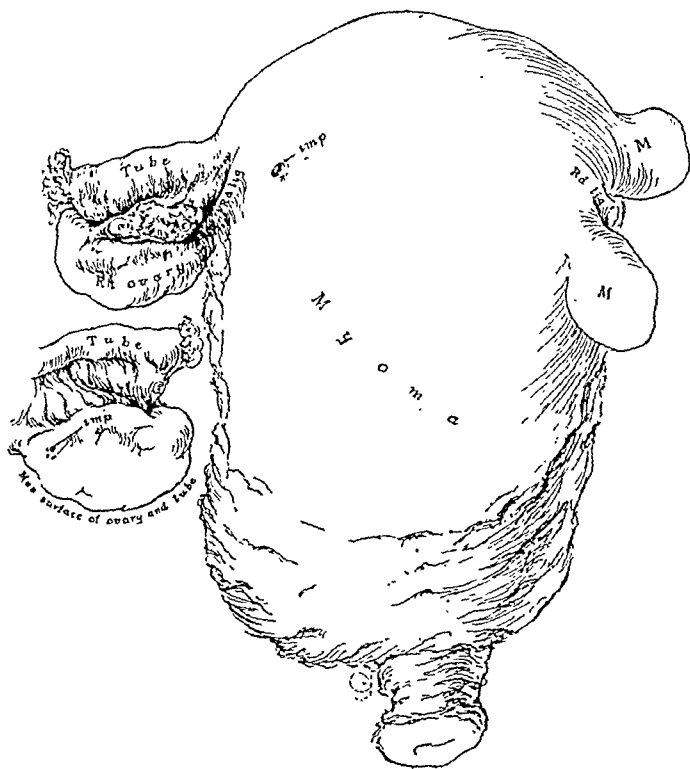


Fig. 9.—(Case 15). Implantation adenoma of endometrial type of the anterior surface of the uterus mesial to the attachment of the right round ligament and also on the mesial surface of the right ovary; multiple leiomyomas of the uterus. Anterior surface of the uterus, right tube and ovary ( $\times 1/2$ ). The situation of the adenoma on the anterior surface of the uterus is indicated (imp.) and also the one on the mesial surface of the right ovary (see imp. of the insert). The histologic structure of the latter was similar to that shown in Fig. 16. The tube was short and the pelvis was filled by the enlarged uterus, and therefore epithelium, escaping from the tube, would be more apt to lodge on the mesial surface of the ovary than on the lateral. If the epithelial implantations were the result of a retrograde menstruation, or there was any free fluid in the peritoneal cavity, some of the epithelium might become lodged on structures at a distance from the tube.

THE ORIGIN OF THE TUBULES OF ENDOMETRIAL (MÜLLERIAN) TYPE IN THE  
OVARY FROM WHICH HEMATOMAS OF ENDOMETRIAL (MÜLLERIAN)  
TYPE ARISE

The most natural conception of the source of these tubules is from an abnormal development of the surface epithelium of the ovary or from developmentally misplaced epithelium of the müllerian duct.

Theories to this effect have been presented by Russell,<sup>4</sup> Casler,<sup>5</sup> Norris<sup>6</sup> and more recently by Janney.<sup>7</sup> It is difficult to disprove any of these theories. The implantation theory which I have presented,<sup>2</sup> that these tubules arise from epithelium (possibly both tubal and uterine) escaping from or through the tube, is based on the following data:

Epithelium is found on the surface of the ovaries in these specimens, invading the underlying tissue as tubules. The epithelium lining these tubules is often ciliated; sometimes the tubules suggest a tubal origin and at other times a uterine. The ovarian tissue about the epithelium on the surface of the ovary as well as that about the tubules in the deeper portions, sometimes reacts to menstruation.

In some cases minute adenomas of apparently the same age are found only on the surface of the ovary, in others both on the surface

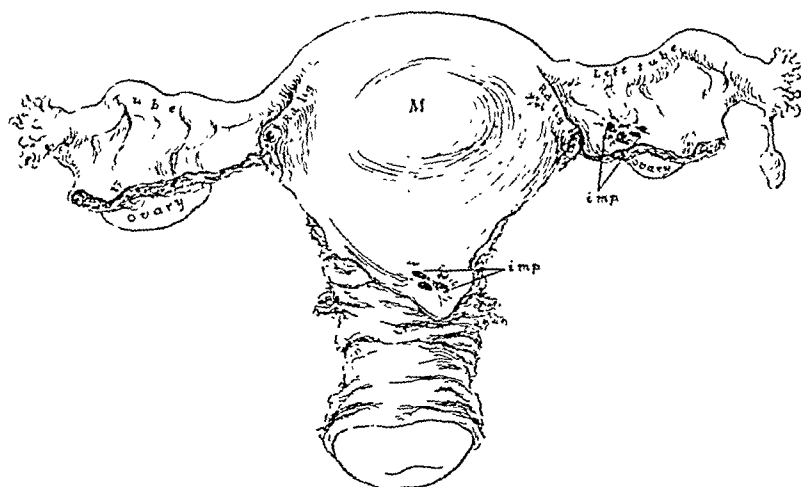


Fig. 10.—(Case 4). Implantation adenoma of endometrial type of the posterior surface of the uterus near the attachment of the left broad ligament, the anterior surface of the left broad ligament and the vesico-uterine fold of peritoneum; leiomyomas of the uterus. Anterior view of the uterus ( $\times 1/2$ ). The implantation adenomas of the anterior surface of the left broad ligament and the vesico-uterine fold are indicated (imp.). A pigmented elevation about 4 mm. in diameter was found on the lateral surface of the right ovary. Histologically it consisted of pigmented cells (old hemorrhage) without any epithelium. It might represent the remains of a hematoma of endometrial type, in which all of the epithelial lining had been cast off by menstruation, and the implantation adenomas might have arisen from this source. The epithelium causing the implantations might have escaped from the tubes, having been carried to distant portions of the pelvis by such factors as a profuse retrograde menstruation, or free fluid in the peritoneal cavity. Usually the implantations, apparently arising from or through the tubes, are situated in places which are or might have been in contact with the fimbriated ends of the tubes as shown in previous illustrations. Even a small amount of fluid escaping from the tubes, as well shown in some cases of purulent salpingitis and tubal pregnancy, may reach other portions of the pelvis than that about the fimbriated opening of the tube.

of the ovary and on the pelvic peritoneum, and in still others only on the latter. These are all most frequently present in places where material escaping from the tube would be most apt to lodge (Figs. 2 to 10 inclusive), and suggest a common origin from the latter.

These hematomas are unusual in women under thirty years of age and if they were of developmental and not of acquired origin we would expect them to occur in younger women, soon after puberty.

They develop during the menstrual life of the patient, when tubal

and uterine epithelium would be more likely to escape from or through the fimbriated end of the tube than before puberty and after the menopause. It is possible that the implantation on the ovary of epithelium derived from or through the tube may occur before puberty and after the menopause, and may develop into ovarian cysts or even carcinoma.

The uterus in these cases is often retroflexed, contains leiomyomas and polyps, conditions which might favor a back flow of menstrual blood through the tube.

In the fifty-six cases of ovarian hematoma of this type which I



Fig. 11.—(Case 12). Cross section ( $\times 8$ ) of the distal end of the left fallopian tube shown in Fig. 5. Bilateral hematosalpinx, with adenomatous structure of the distal end of both tubes was present, possibly originating from a folding in of the fimbriae of the tubes. The glands and dilated glands or tubules in this section resemble, histologically, the glands and tubules found in some of the implantation adenomas of endometrial type. Hemorrhage was present in places beneath the epithelial lining of some of the tubules; in other places the epithelial lining was absent, apparently having been cast off by the hemorrhage rupturing into the cavity of the tube. Endothelial leucocytes were also present. The hemorrhagic contents of the hematosalpinx evidently arose from this source; a probable reaction to menstruation. Some of the hemorrhagic contents of the hematosalpinx including epithelium cast off by menstruation might have escaped, at one time, into the peritoneal cavity, and could have been the source of the implantation adenoma on the posterior wall of the uterus; shown in Figs. 5 and 12.

have studied, the tubes were apparently patent in all, suggesting that this source of implantation was open in all of these cases. The presence of occluded tubes would not exclude the origin of the ovarian implantations from this source as they might have occurred before the tubes had become closed. In the fifteen cases of pelvic implantations apparently not derived from a perforated ovarian hematoma the



tubes were patent in all but one instance. In that case (case 12 of this series) bilateral hematosalpinx was present with "adenomyoma" of the fimbriated ends of both tubes and the extension of the adenoma to the peritoneal surface of the tubes (Figs. 5, 11 and 12). The implantation adenoma of the posterior surface of the uterus resembled histologically the adenoma in the tube, and was found at the operation in close proximity to the end of one of the tubes, from which I believe it arose.

Implantations of endometrial type on the peritoneal surface of the pelvic structures apparently arise from the escape of the contents of an ovarian hematoma of this type and furthermore similar implantations occur on the surface of the ovary about the perforation,

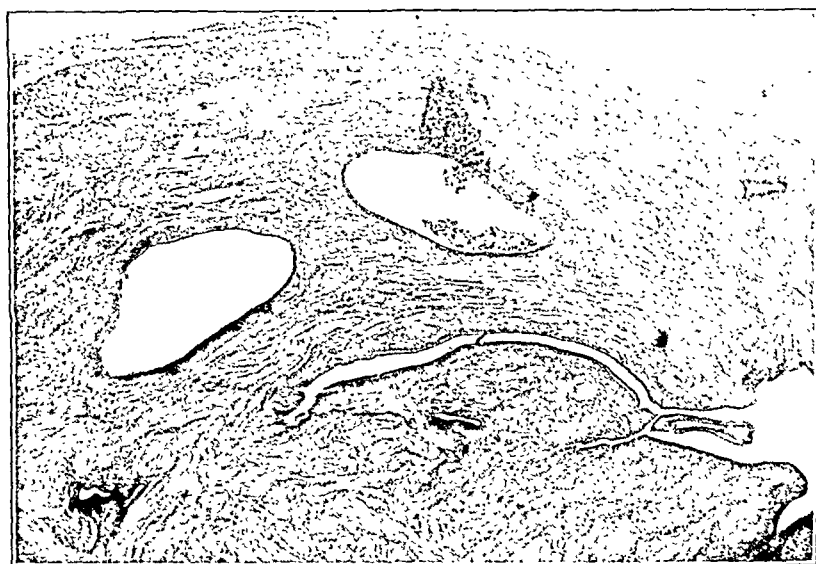


Fig. 12.—(Case 12). Photomicrograph (obj. 16 mm.) of a section of a portion of the implantation adenoma of the posterior surface of the uterus shown in Fig. 5. Histologically it resembles the glands and dilated glands or tubules shown in Fig. 11. I believe that it could have arisen from the implantation of epithelium escaping from the fallopian tube as stated in the legend of Fig. 11.

and possibly also on the opposite ovary. The implantations involving the ovaries from this source simulated the original ovarian implantations, but were apparently often more virulent, and more closely resembled typical endometrium in those specimens studied. As implantations arise from the perforation of the ovarian hematomas so may ovarian hematomas arise from implantations. The most obvious source of the latter in the absence of an ovarian hematoma with evidence of perforation is from or through the fallopian tubes.

These ovarian hematomas are often bilateral, and usually develop and perforate on the lateral or the under surface of the ovaries, the portions of the ovaries which are anatomically most frequently in contact with the fimbriae of the tubes (Fig. 1), as will be discussed later.

The escape of the ovum from the ovary into the fallopian tube during ovulation is an evidence of the close contact of the opening of the tube and its fimbriae with the surface of the ovary. This same close contact would favor the implantation of epithelium on the surface of the ovary from the fimbriae of the tube or from epithelium escaping through its lumen.

We have abundant proof that apparently normal uterine and tubal epithelium may be invasive, as demonstrated in the development of "adenomyoma" from the invasion of the uterine and tubal wall by the epithelium lining their cavities.

As has been already stated, implantation adenoma may also arise from the perforation of ovarian hematomas of endometrial type, as



Fig. 13.—(Case 13). Photomicrograph (obj. 50 mm.) of a section of the adenomatous nodule situated mesial to the uterine attachment of the right utero-sacral ligament shown in Fig. 4. It is an adenoma of endometrial (müllerian) type resembling the adenoma shown in Fig. 12. It could have arisen from epithelium escaping from or through the fallopian tube as indicated in Fig. 4. It is impossible to state whether this epithelium was derived from the tubal or the uterine mucosa. Histologically it could have arisen from either, but possibly it suggests more closely a tubal origin.

shown in my first communication (possibly not yet accepted by others).

Why is not every cesarean section, hysterotomy, salpingectomy and ruptured tubal pregnancy followed by implantation adenoma? Conditions may not always be suitable for the implantation of epithelium. Dr. F. B. Mallory of Boston, Mass., in a personal communication to me, states that he has examined two specimens of adenoma of endometrial type found in the scar of the abdominal incision after cesarean section.

During the last year, Dr. Victor C. Jacobson has experimentally proved, in the pathological laboratory of the Albany Hospital and

the Albany Medical College, that the uterine mucosa of the rabbit may be transplanted and give rise to adenoma of endometrial type resembling those described by me except for the absence of any reaction to menstruation; furthermore some of the transplantations made by him in the ovary developed into "ovarian cysts." The results of these experiments have been reported by him under the title "The Autotransplantation of Endometrial Tissue in the Rabbit."<sup>8</sup>

Since September, 1921, I have been studying the situation of the fimbriated end of the normal fallopian tube as found at operation. With the patient in the Trendelenburg position the uterus, tubes and ovaries were carefully exposed without disturbing their relation to each other; and the exact situation of the fimbriated ends of the tubes was observed. In several instances sketches demonstrating the con-



Fig. 14.—(Case 17). Photomicrograph (obj. 50 mm.) of a section of the implantation adenoma in the culdesac shown in Fig. 6. Histologically it resembles uterine mucosa, and suggests either that the epithelium giving rise to it resulted from a retrograde menstruation through the tube, carrying some of the uterine epithelium with it; or if it arose from tubal epithelium that the latter developed into a structure simulating uterine mucosa.

ditions found were made at the operation by Miss Oliver. The position of the fimbriated end of the normal tube depends upon many factors, such as the length of the tube, the length of its mesentery at the fimbriated extremity, and the condition of the surrounding parts. As the fimbriated end of the normal tube is freely movable, it will naturally be pushed or slipped into places where it will be the least in the way. The length of the tube is usually greater than the distance from the cornu of the uterus to the distal pole of the ovary, so that its fimbriated end is usually found behind the ovary or below and mesial to it. The distal pole of the ovary frequently extends beyond the attachment of its suspensory ligament in such a way as to form a groove between it and the suspensory ligament. The distal portion of the fallopian tube easily slips into this groove, and the fimbriated end

of the tube lies between the ovary and the side of the pelvis, or beneath the ovary, often with the opening directed towards the ovary, due to the tether-like action of the distal portion of the mesosalpinx (Fig. 1). If this groove is shallow or absent the distal portion of the tube usually hangs down in the pelvis (over) mesial to the ovary in such a way that the tubal fimbriae are in contact with the structures in the bottom of the culdesac (Fig. 1). Even in this latter group the fimbriated end of the tube is often found tucked beneath the ovary. These are the two most frequent situations of the tube but occasionally it is found in others (Figs. 8 and 9). Material (including epithelium) escaping from the fimbriae of the tube or through its lumen, would be apt to lodge on the structures in contact with the fimbriae of the tube. If implantations of epithelium should arise from this source we would expect to find them on the lateral and the under surface of the ovary and in the culdesac, especially about the utero-

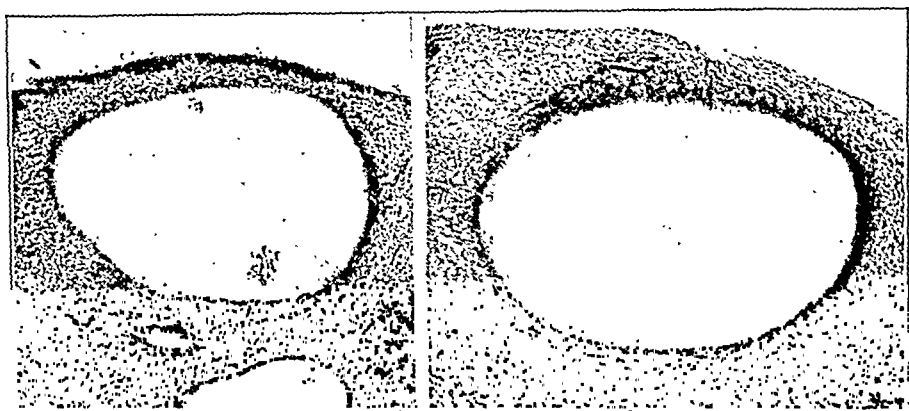


Fig. 15.—(Case 17). Photomicrograph (obj. 16 mm.) of a section of the adenoma of the right ovary indicated in Fig. 6 and also of uterine mucosa with glandular dilatation for comparison. The photomicrograph of the uterine mucosa is shown to the left and that of the adenoma of the ovary to the right. A dilated "gland" with a small gland (*g*) above it appears in this section of the adenoma of the ovary. Hemorrhage is present in the ovarian tissue about the dilated gland, giving rise to the "blueberry" appearance of the surface of the ovary over the adenoma as shown in Fig. 21. The epithelial lining of the dilated gland of the ovarian adenoma was identical with that of the dilated gland in the uterine mucosa; low to cuboidal, the latter predominating.

sacral ligaments and on the posterior surface of the broad ligament. It is in these situations that the early (primary) implantation adenomas are most frequently found. The implantation adenomas seem to thrive in ovarian tissue and smooth muscle. As women spend the greater portion of the twenty-four hours of the day with the body in the upright posture, whether sitting down or standing, the tendency for the fimbriated end of the tube to be tucked beneath, or lateral to, the ovary would be increased, and "sediment" escaping from the tube would naturally settle on the lateral and the under surface of the ovary and in the bottom of the culdesac, especially its anterior portion.

Implantation adenoma may occur on the ovary alone, especially on

its lateral or its under surface, or on the surface of the ovary and in the pelvis, especially the culdesac, or in the pelvis alone. The pelvic implantations are usually small but may spread and become invasive. The ovarian implantations usually develop into hematomas of endometrial type which sometimes attain a large size, 6 to 9 cm. in diameter. Whether the ovarian hematomas are large or small, perforation usually occurs and implantation adenomas arise in the pelvis, which, in their distribution, correspond to the implantations of carcinoma from the perforation of a malignant ovarian cyst. They may occur

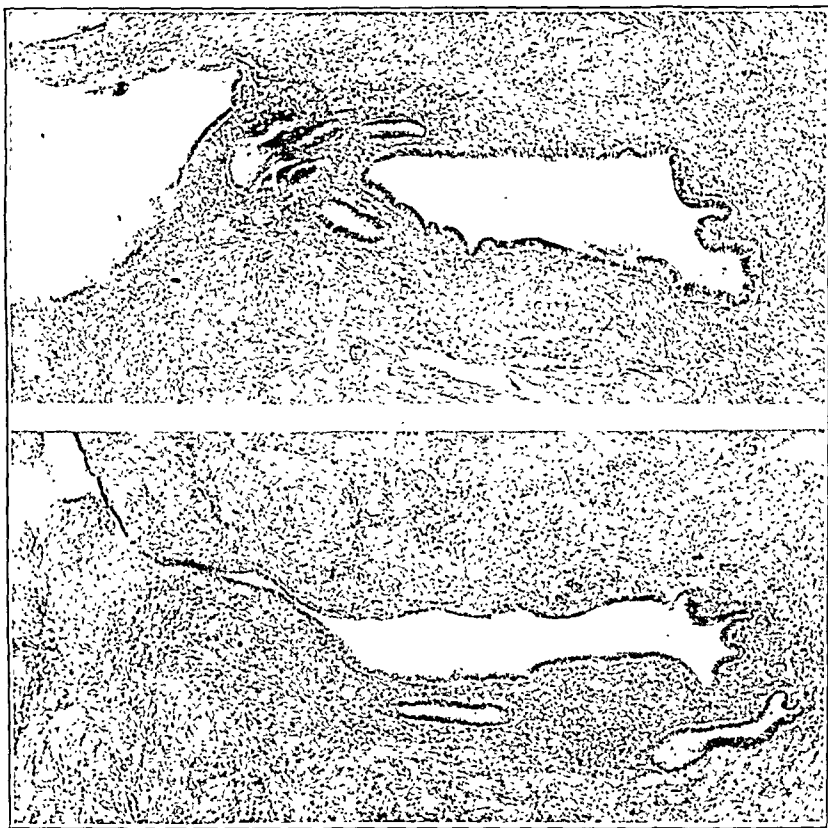


Fig. 16.—(Case 16). Photomicrographs (obj. 16 mm.) of the adenomas of endometrial (müllerian) type invading the lateral surface of the right ovary and the posterior surface of the uterus, as indicated in Fig. 7. The lower one is ovarian and the upper one uterine. Their histological structure is similar, and I believe that they both have a common origin from epithelium escaping from or through the fallopian tube. It is impossible to decide, from their structure, whether the epithelium was derived from the tubal or the uterine mucosa.

on any of the pelvic structures, including the surface of the ovary about the site of the perforation.

The relation between ovarian hematomas of endometrial type and implantation adenomas of the same type in the pelvis is very interesting. I have had three cases of typical ovarian hematoma without gross evidence of perforation, and was unable to find any evidence of adhesions or implantations in the pelvis. I believe that the subsequent perforation of the hematomas in these three cases would prob-

ably be followed by implantations in the pelvis. In forty-three cases of ovarian hematomas with evidence of perforation, in which the adhesions apparently resulting from the escape of the contents of the hematoma were studied microscopically, implantation adenoma of endometrial type was found in some portion of this tissue in all but one instance. The larger the hematoma, and apparently the greater the size of the perforation, usually the greater the distribution of the implantations. The pelvic implantations could have arisen from two possible sources in these cases: first, as primary implantations from or through the tubes, the source of the adenomas of the ovary or ovaries from which the ovarian hematomas arose, and secondly, as secondary implantations from the perforation of the ovarian hematoma. In some of these cases implantations which probably arose from both sources were present. In other cases the implantations may have arisen only from one source, either the tube or the ovary. I believe that when there is evidence of an ovarian hematoma with perforation, the hematoma is usually the principal and sometimes the only source of the accompanying implantations. All specimens of extensive implantation adenomas which I have studied have been associated with an ovarian hematoma of endometrial type, with evidence of perforation as in Figs. 61 and 62.

I have studied fifteen cases of implantation adenoma in the pelvis in which the implantations were apparently of tubal (from or through) rather than of ovarian origin, although the latter source cannot be positively excluded, as small ovarian hematomas may sometimes disappear after perforation. The implantations in all these cases were small as in Figs. 3, 4 and 5. Seven of these fifteen cases are reported in full in this communication and eight of them were mentioned in a previous paper.<sup>3</sup> One or both ovaries were removed in all but two cases. In the ovaries of nine of the thirteen cases which were examined, tubules of müllerian type were found, which could be interpreted as the possible remains of a small ovarian hematoma that had perforated, but I am more inclined to consider them as tubules which had not yet developed into hematomas. It was interesting to note the character of the implantations when there was no gross evidence of an ovarian hematoma with perforation. They were usually smaller, less invasive and not as widely distributed as those generally found in the pelvis associated with an ovarian hematoma with evidence of perforation. (Compare Figs. 3, 4 and 5 with Figs. 61 and 62.) Many of them also presented a little different histologic picture; they usually did not resemble typical endometrium as closely as did the implantations which were associated with an ovarian hematoma with perforation. The study of these fifteen cases suggested that the epithelium from which the implantations arose was derived from the tubal mu-

cosa in some, and from the uterine mucosa (menstruation with a back flow through the tubes) in others. In the latter group they may have arisen from a portion of tubal mucosa which had reacted to menstruation. The implantations in nearly all cases apparently reacted to menstruation, which might be interpreted as evidence against the epithelium being derived from the mucosa of the tube; but this function may have been acquired after implantation. The tubules in the ovaries from which the hematomas arise at times suggest a tubal origin, and at other times a uterine origin; but the implantations which apparently arise from the perforation of the ovarian hematoma, while they sometimes resembled the glandular elements of both tubal and uterine adenomyoma in the same case, more often resembled those of uterine adenomyoma. These observations suggest that the ovarian implantations from which the hematomas arose may have been derived both from tubal and uterine epithelium; but even if of tubal origin, by its growth in the ovarian hematoma it was converted into structures of uterine type.

In all, sixty-five specimens containing ovarian hematomas (hemorrhagic cysts) in various stages of development (this includes nine specimens with adenomas which had not yet developed into hemorrhagic cysts) and retrogression have been studied, eighteen of these being bilateral. In many instances multiple hematomas were present in the same ovary. Many were small, ranging in size from those just visible to the naked eye to those a few millimeters in diameter. Most of the larger ones varied in size from 1 to 4 cm. in diameter

## PLATE I

Fig. 17.—Plate I (Case 18). The appearance of the surface of the implantation adenoma in the culdesac (*b*) Fig. 3, (natural size). The "red raspberry" appearance is due to recent hemorrhage, the last menstruation having ceased the day before the operation. For histologic structure of the implantation see Fig. 24.

Fig. 18.—Plate I (Case 18). The appearance of the implantation adenoma on the posterior surface of the right cornu of the uterus, (*c*) Fig. 3, (natural size). It is possibly a contact implantation from the adenoma in the culdesac, (uterus retroflexed) as explained in the legend of Fig. 3. Like the preceding, it has a strawberry or red raspberry appearance; its histologic structure is also similar.

Fig. 19.—Plate I (Case 18). The appearance of the implantation adenoma on the posterior surface of the right broad ligament, (*a*) Fig. 3, (natural size). It resembles a blueberry in coloring. Apparently there was very little reaction to the last menstrual period; old hemorrhage was present giving it a darker coloration than the preceding.

Fig. 20.—Plate I (Case 12). The appearance of the implantation adenoma on the posterior surface of the uterus (Figs. 5 and 12) (natural size). The last menstruation occurred three weeks before the operation. The blood contained in the adenoma was old, hence the "blueberry" appearance of the elevations on the surface.

Fig. 21.—Plate I (Case 17). The appearance of the adenoma on the under surface of the right ovary (natural size). See also Figs. 6 and 15. The last menstruation occurred a week before the operation. The surface of the adenoma has the "blueberry" coloration due to old hemorrhage in the ovarian tissue.

Fig. 22.—Plate I (Case 20). The lateral surface of the left ovary, showing implantation adenoma: "ad" which appears red due to recent hemorrhage (natural size). The patient was due to menstruate the day of the operation. For histologic structure of the adenoma see Fig. 23.

Fig. 23.—Plate I (Case 20). Reproduction of a colored photomicrograph of a section of the adenoma shown in Fig. 22, H. & E. stain (obj. 16 mm.). A dilated gland or tubule lined by columnar epithelium is present. This epithelium is surrounded by a recent hemorrhage (premenstrual) in the ovarian tissue about it. Hemorrhagic cysts or hematomas of endometrial type arise from these adenomas (Figs. 25 to 29). The adenomas arise from the implantation of epithelium escaping from the tube or from other implantations; especially from the perforation of an ovarian hematoma of endometrial type. In this case I believe the epithelium came from or through the tube.



Fig. 17



Fig. 18



Fig. 19



Fig. 20



Fig. 21



Fig. 22

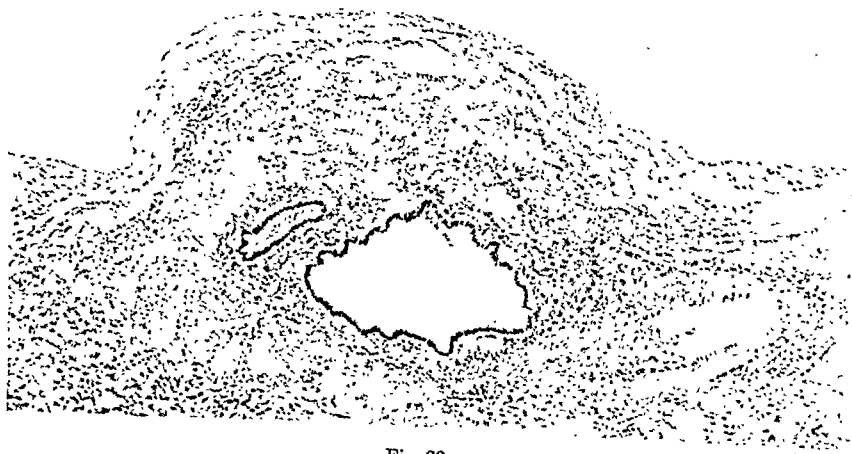


Fig. 23





and only three were over 6 cm. in diameter, the largest being about 9 cm. Perforation had occurred in many of the small ones a few millimeters in diameter, and in most of the hematomas over 1 cm. in diameter; but there was abundant opportunity to study hematomas of all sizes before perforation had taken place.

These hematomas arise from glands and tubules of endometrial (müllerian) type which penetrate the ovary from its surface, usually the lateral and the free surface. The hematomas may be superficial or deep. An ovary may contain only superficial hematomas or only deep ones, but often contains both, in various stages of development and retrogression. Perforation usually occurs in the superficial ones while they are still small, only a few millimeters in diameter. On the other hand the deep ones may reach a larger size, a few to several centimeters in diameter, before perforation occurs. It is impossible to group all of the specimens according to the situation of the hematomas, just as it is impossible to classify all uteri containing leiomyomas according to the situation of the latter. In both instances multiple growths are usually found in the periphery and the deeper portions of the ovary or the uterus. We may, however, study the development and retrogression of the superficial and deeper hematomas separately.

#### THE DEVELOPMENT AND RETROGRESSION OF SUPERFICIAL HEMATOMAS (HEMORRHAGIC CYSTS) OF ENDOMETRIAL (MÜLLERIAN) TYPE

These hematomas arise from glands or tubules of endometrial (müllerian) type which are situated on the surface of the ovary or in its cortex. Hemorrhage occurs in the ovarian tissue about the gland, even when the lumen of the gland is small (Figs. 23 and 26). The lumen of the gland, or tubule, becomes larger and at first seems to be filled with serum giving rise to a small cyst with hemorrhage in its walls (Fig. 27). The blood surrounding the epithelial lining next ruptures through the overlying epithelial tissue carrying some of the latter with it and escapes into the cavity of the dilated gland or cyst (Figs. 28 and 29). In this way the ovarian hematoma arises. If the tension within the small hematoma is sufficiently great and the overlying wall of the cyst is thin, perforation occurs and some or all of the hemorrhagic contents containing some epithelium, cast off by menstruation, escapes into the peritoneal cavity (Fig. 30). I believe implantation adenoma of endometrial type may arise wherever this epithelium lodges on suitable soil whether on the surface of the ovary, about the site of the perforation, or on the peritoneal surface of the pelvic structures; especially in the culdesac. Perforation may occur in very small hematomas from 1 to 3 mm. in diameter. The perforation may become sealed and the hematoma reform, in time to

be followed by another or other perforations. If all of the epithelial lining is cast off by menstruation the life of the hemorrhagic cyst is ended, and all evidence of it may disappear. If most of the epithelium is removed and but a few cells persist, these cells may re-form first into glands (Fig. 31) and later possibly into hematomas. It is also possible that all the epithelial lining may be cast off by the underlying hemorrhage rupturing into the lumen of the hematoma, and that the hemorrhagic cyst may die without perforation. The life of the hematoma or hemorrhagic cyst and its reaction to menstruation before and after perforation apparently depend on the presence of its epithelial lining.

The superficial hematomas are small, rarely over 5 mm. in diameter, more frequently between 1 and 3 mm. in diameter. If they have recently reacted to menstruation they are red in color, later bluish black (Figs. 21 and 22). They are usually multiple, and are often found in various stages of development and retrogression in the same specimen, suggesting that they are not all of the same age. The perforation of one may lead to the development of others by implantation on the surface of the ovary, or there may be multiple

## PLATE II

Fig. 24.—Plate II (Case 18). Reproduction of a colored photomicrograph (obj. 16 m.m.) of a section of the peritoneal implantation adenoma shown in Fig. 17. Glands and tubules of endometrial type are present, the tissues of the peritoneum are thickened and recent stromal hemorrhage is situated in these tissues giving the "red raspberry" appearance of the implantation (Fig. 17). The histologic appearance of this implantation is similar to that shown in the preceding and the following illustration, except for the situation of the hemorrhage. The hemorrhage in the ovarian adenomas is more closely confined to the tissues surrounding the glands or tubules. As in the preceding instance, peritoneal implantations arise from epithelium escaping from the tube or other implantations (especially from the perforation of an ovarian hematoma). In this case I believe the epithelium came from or through the tube.

Fig. 25.—Plate II (Case 7). Reproduction of a colored photomicrograph (obj. 16 mm.) of a section through one of the small pigmented elevations on the lateral surface of the right ovary shown in Fig. 33. The gland-like spaces are lined by cuboidal epithelium; some of the cells are ciliated. There is an extravasation of blood in the tissues about the glands, which I interpret as a reaction to menstruation and believe that these glands arose from epithelium escaping from the tube or from the perforation of an ovarian hematoma as Fig. 30 from the same ovary. The operation occurred eighteen days after the last menstrual period and the patient menstruated every two to three weeks.

Fig. 26.—Plate II (Case 3).—Reproduction of a colored photomicrograph (obj. 16 mm.) of a section through a gland-like space imbedded in the superficial tissues of the right ovary (b. Fig. 41). The cells are cuboidal to columnar; some are ciliated. There is a marked extravasation of blood in the tissues about the gland which I interpret as a reaction to menstruation. The patient was operated upon the second day of the menstrual flow. It is from these gland-like structures that hematomas (hemorrhagic cysts) of endometrial type arise. This represents the first stage in the development of a superficial hemorrhagic cyst, namely, peripheral stromal hemorrhage.

Fig. 27.—Plate II (Case 7). Reproduction of a colored photomicrograph (obj. 16 mm.) through a dilated gland of endometrial type. The epithelial cells lining the gland are cuboidal to columnar, and many are ciliated. It is a miniature hemorrhagic cyst of endometrial type with hemorrhage about it. This represents the second stage in the development of a hemorrhagic cyst, namely, peripheral hemorrhage (subepithelial) and dilatation of the gland or tubule. The pigmented cells in the cavity of the cyst indicate that there has been a previous slight escape of blood through the epithelial lining.

Fig. 28.—Plate II (Case 5). Reproduction of a colored photomicrograph (obj. 16 mm.) through a section of one of the small pigmented elevations on the lateral surface of the right ovary shown in Fig. 2. The patient was menstruating the day of the operation. Subepithelial hemorrhage is present, and in one place the blood has ruptured through the epithelial lining and is escaping into the cavity of the miniature hemorrhagic cyst, carrying some of the epithelial cells with it. This represents the third stage in the development of a superficial ovarian hematoma, or hemorrhagic cyst of endometrial type, namely, hemorrhage into the cavity of the cyst. The wall of the cyst was torn in cutting the section.

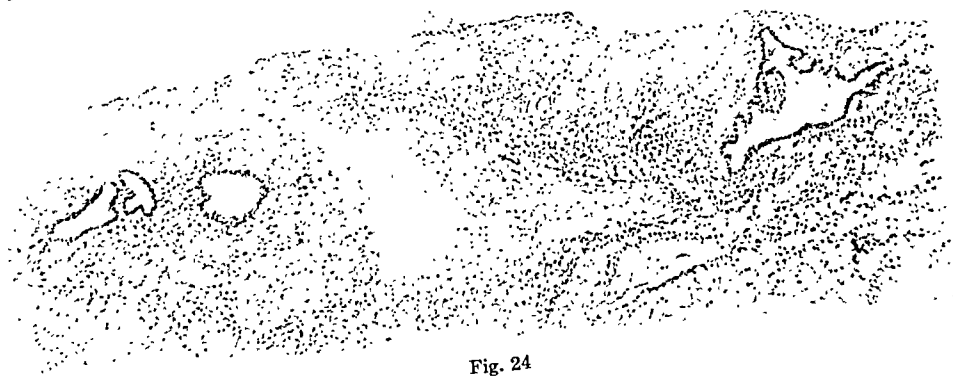


Fig. 24



Fig. 25



Fig. 26

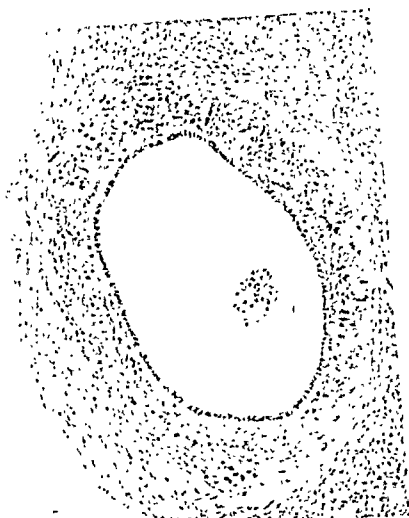


Fig. 27



Fig. 28



primary implantations from the tubes. They are most frequently found on the lateral and under surface of the ovary, very rarely on the mesial surface. The lateral and under surfaces of the ovary are the portions most frequently in contact with the fimbriae of the tube (Fig. 1).

THE DEVELOPMENT AND RETROGRESSION OF DEEP OVARIAN HEMATOMAS  
(HEMORRHAGIC CYSTS) OF ENDOMETRIAL (MÜLLERIAN) TYPE

These arise from glands or tubules of müllerian type situated in the deep tissues of the ovary, which react to menstruation. It was impossible in every instance to determine the source of the tubules from which the hematomas arose, but in many specimens it was evident that the hematoma had developed from a gland or tubule which had invaded the ovarian tissue from its surface. Tubules were found in these specimens invading the ovarian tissue from its surface (Figs. 39 and 40) and also extending in various directions through the deeper tissues of the ovary. Hematomas developed in the dilated portions of these tubules (Fig. 54). While complete serial sections were not made of any of the ovaries, enough sections were made from some specimens to demonstrate that multiple small hematomas may arise in the tortuous course of a tubule, just as multiple ponds and lakes may arise in the course of a stream. Furthermore, even in some of the medium-sized and larger hematomas the tubule from which they apparently arose was found emptying into or growing away from them (Figs. 37 and 42). It is difficult to conceive why one portion of a tubule may develop into a hematoma while other portions of the same tubule fail to do so. The early stages in the development of the deeper hematomas are the same as the early stages in the development of the superficial hematomas. Three possible outcomes may result: First the hematoma, in time, reaches the surface of the ovary and perforation occurs; the hematoma may attain a large size (several centimeters in diameter) before this takes place. Secondly, the hematoma may increase in size so slowly that perforation never occurs and it ceases to grow after the menopause. Thirdly, the epithelial lining may be completely cast off in its repeated reactions to menstruation and the life of the hematoma ceases and if small, the remains may be completely absorbed.

The histologic study of the hematomas before perforation is most interesting. The reaction to menstruation manifests itself by hemorrhage into the ovarian tissues beneath the epithelial lining (Fig. 42); and by rupture through the overlying epithelium into the cavity of the hematoma, carrying with it some of the epithelial lining. This is followed by the attempt to repair, which manifests itself by two definite reactions. First, as there is no avenue for the escape of

the menstrual blood, other than the cavity of the hematoma or hemorrhagic cyst, some of it is retained in the wall of the cyst, disintegrates and is changed into blood pigment but the greater portion of it is retained in the cavity of the hematoma. Endothelial leucocytes may arise in the wall of the hematoma and wander out into its cavity through the breach caused by the menstrual hemorrhage (Figs. 47 and 50) and as phagocytes devour the red blood corpuscles (Fig. 45). As yet I am not convinced that they wander back into the ovarian stroma again carrying with them their load of disintegrated red blood corpuscles. The endothelial leucocytes both in the cavity of the hematoma and in the stroma break down, setting free the blood pigment. Hyaline fibrous tissue arises in the stroma of the denuded lining of the hematoma (Fig. 48). This process gives rise to a thickened pigmented lining of the hematoma without an epithelial covering which in certain stages of its development might be confused with the lining of a corpus luteum hematoma, the endothelial leucocytes being mistaken for luteal cells.

The second reaction in the attempt to repair, is the relining of the denuded portion of the wall of the hematoma by epithelium from epithelial cells which had not been cast off. This epithelium is found elongated and growing over the denuded pigmented lining of the hematoma (Fig. 51).

The histologic picture in different hematomas varies greatly. Some are completely or almost completely lined by epithelium with evidence of recent and old (blood pigment) hemorrhage in

### PLATE III

Fig. 29.—Plate III (Case 5). Reproduction of a colored photomicrograph (obj. 50 mm.) of a section through the pigmented elevation on the lateral surface of the left ovary, shown in Fig. 2. It is a small superficial hemorrhagic cyst of endometrial type. The greater portion of the epithelial lining has been cast off by the subepithelial hemorrhage (menstrual) rupturing into the cavity of the cyst. Epithelial and stroma cells are present in the small piece of tissue (a) shown in the hemorrhagic contents of the cyst (see also Fig. 32). Should the cyst rupture, the hemorrhagic contents, including epithelium and stroma cells, would escape into the peritoneal cavity. Should the epithelium fall on suitable soil, implantation adenoma would arise, which I have designated as secondary implantations, in contradistinction to the primary ones arising from the tube. Peritoneal implantations were not observed in this case, but I believe they would have arisen later from epithelium escaping through the perforation of the hemorrhagic cyst, had the cyst not been removed by operation.

Fig. 30.—Plate III (Case 7). Reproduction of a colored photomicrograph (obj. 50 mm.) through a superficial hemorrhagic cyst of endometrial type which had perforated. This is one of the pigmented elevations shown on the lateral surface of right ovary (Fig. 33). The walls of the cyst are collapsed and some of the epithelial lining has been cast off by the subepithelial hemorrhage in its walls rupturing into the cavity of the cyst. Some of this cast off epithelium was probably carried with the contents of the cyst, escaping through the perforation into the peritoneal cavity; it may have lodged on suitable "soil" and might have been the cause of some of the peritoneal implantation adenomas present in this case. Should all of the epithelium be cast off, the life of the cyst would probably cease. If a few cells were retained they might develop into adenomas, and give rise to the condition shown in the next illustration.

Fig. 31.—Plate III (Case 6 of second series<sup>2</sup>). Reproduction of a colored photomicrograph (obj. 50 mm.) through a small pigmented area on the lateral surface of the right ovary. The uterus contained multiple leiomyomas. Implantation adenomas of endometrial type were present in the culdesac, and also invading the appendix. Adhesions were present on the surface of the ovary. Two glands or tubules of endometrial type are shown, as well as yellow pigmented cells, the probable remains of hemorrhage in the ovarian stroma. These could be interpreted as the remains of a perforated hemorrhagic cyst in which nearly all of the epithelial lining had been cast off, and in the repair which followed, the epithelial cells which remained developed into glands. The implantation adenomas in this case might have arisen from the epithelium escaping through the perforation of the cyst.



Fig. 29



Fig. 30

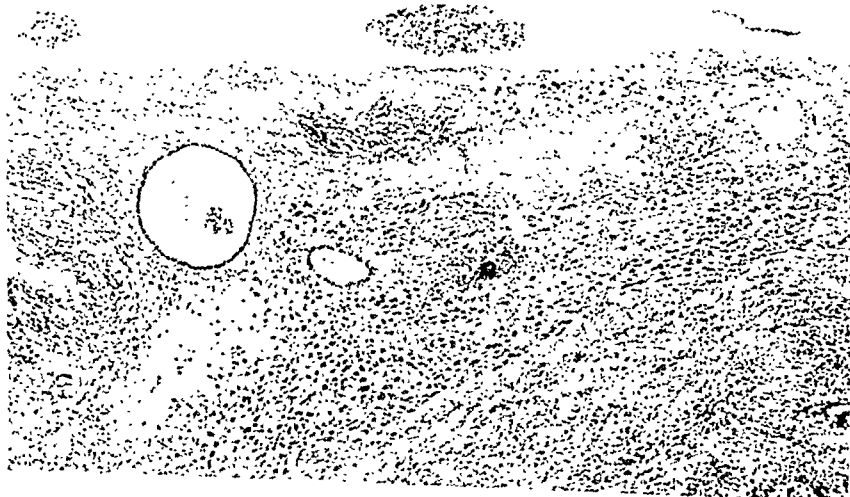


Fig. 31





the underlying tissues. In some the entire lining of the hematoma has reacted to menstruation while in others only small areas have reacted. In other hematomas the epithelial lining may be entirely or almost entirely destroyed and the hematoma is lined by the pigmented tissue described above. In many of the specimens one finds several or all of the stages in the reaction of the hematoma to menstruation and the attempted repair following it. In places there is an epithelial lining without the underlying hemorrhage, in other situations evidence of the hemorrhage rupturing into the cavity with loss of the overlying epithelium, endothelial leucocytes forming and escaping into the cavity, the development of the pigmented layer from the endothelial leucocytes, the breaking down of the endothelial leucocytes and deposit of blood pigment in the tissues of this layer, the formation of hyaline connective tissue and finally the



Fig. 32.—(Case 5). Photomicrograph (obj. 4 mm.) of a section of the piece of tissue in the hemorrhagic contents of the hematoma shown in Fig. 29. It consists of epithelial cells, stroma cells and leucocytes, surrounded by red blood corpuscles. Had perforation occurred prior to the operation this piece of tissue would have escaped into the peritoneal cavity, and might have developed into an implantation adenoma of endometrial type. Possibly the "nature" of the blood (menstrual), as well as the leucocytes and stroma cells, may irritate the peritoneum and facilitate the implantation of the epithelium. Clinical observations have shown that the material escaping from these cysts differs from normal blood in that it is very irritating and causes adhesions.

attempt to reline the denuded area from epithelium which has not been cast off by menstruation. Usually all parts of the hematoma do not react to menstruation at the same time. The process of repair is apparently slow and all of the epithelium may be destroyed. The life of the hemorrhagic cyst apparently ceases with the destruction of its epithelial lining (Fig. 56). Some of these hemorrhagic cysts or hematomas lose all of their epithelial lining and "die" before they reach the surface of the ovary and perforate.

The mechanism of perforation can be readily explained by menstrual hemorrhage in a thin portion of the wall of the cyst, which

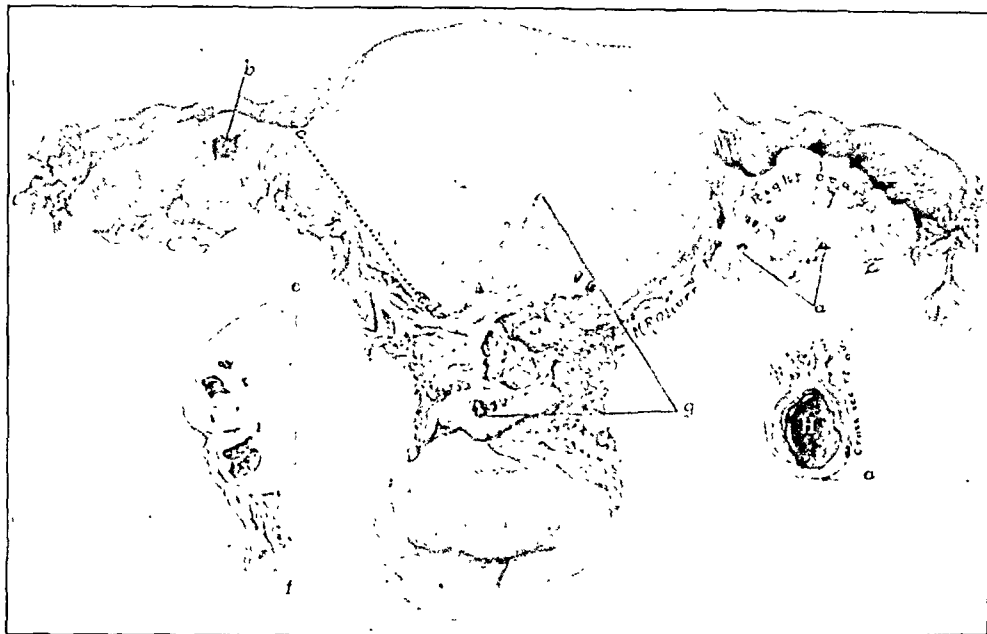


Fig. 33.—(Case 7). Superficial hematomas of endometrial type of both ovaries in various stages of development (some had perforated); implantation adenoma of endometrial type invading the posterior surface of the uterus and forming an "adenomyoma" of that organ; leiomyomas of the uterus, uterine polyps. Posterior view of the specimen removed at operation, ovaries turned upwards exposing their lateral surfaces (x 3/5). The superficial hematomas (a) of the right ovary appear as pigmented elevations (photomicrographs of two of these were shown in Figs. 25 and 30). A typical corpus luteum hematoma (H) is shown in the cross section of the right ovary. Implantation adenoma is superficially invading the posterior surface of the uterus in the area marked by the pointers (g). An "adenomyoma" shown in the insert (e - f) was present in the uterine wall, indicated by the line (c - d). I believe that the implantation adenoma invading the wall of the uterus, as well as the "adenomyoma" arose from epithelium implanted on the surface of the uterus which escaped either from the tubes (both were patent) or from the perforating hematoma of the ovary, or probably from both. A photomicrograph of a section of a portion of the "adenomyoma" is shown in the next illustration.

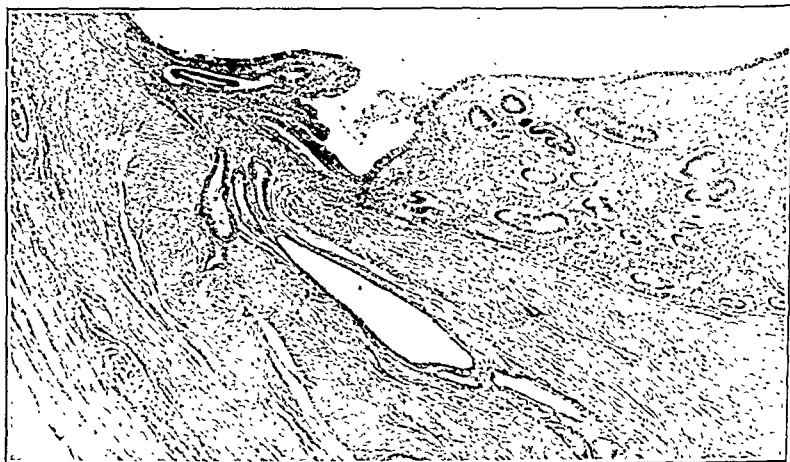


Fig. 34.—Photomicrograph (obj. 50 mm.) of a section of a portion of the "adenomyoma" shown in the insert (e - f) of Fig. 33. As stated in the previous illustration I believe that this "adenomyoma" arose from epithelium implanted on the surface of the uterus, escaping either from the tubes or from the perforation of a small superficial hematoma of the ovary as shown in Fig. 30.

has reached the surface of the ovary. The hemorrhage ruptures first either into the peritoneal cavity or into the cavity of the cyst; per-

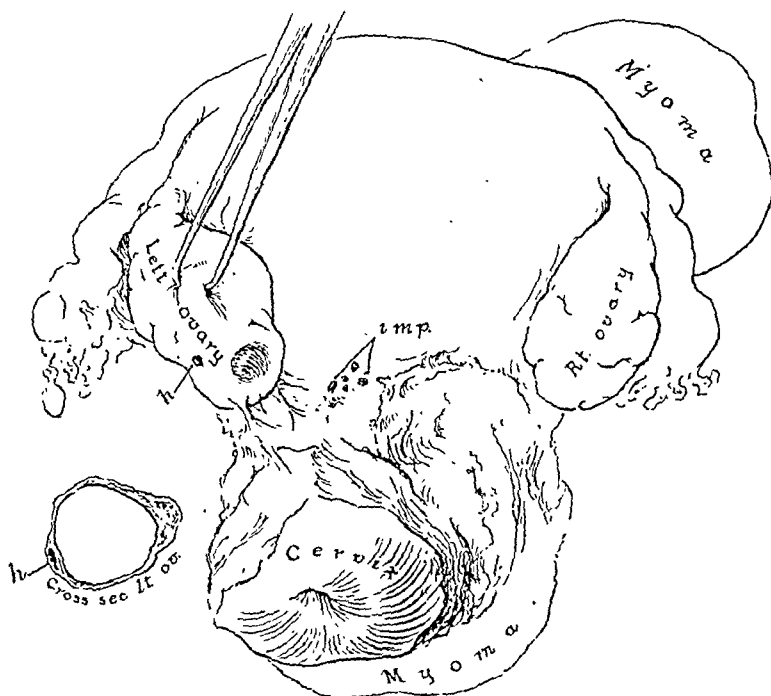


Fig. 35.—(Case 10). Remains of a superficial hematoma of the left ovary, implantation adenoma on the posterior surface of the uterus, multiple leiomyomas of the uterus. Posterior view of the specimen removed at operation ( $\times 4/5$ ). The left ovary was lightly adherent to the posterior surface of the uterus. It is turned upwards, exposing the lateral surface and showing the pigmented elevation (*h*); this is also indicated in the cross section of the cystic ovary. Histologically this pigmented elevation is due to a small cyst-like cavity filled with old blood and without an epithelial lining. I believe that it represents a small hemorrhagic cyst of endometrial type in which the epithelial lining had been cast off. The implantation adenoma (*imp.*) involving the posterior surface of the uterus may have arisen from epithelium escaping from the tubes (both were patent), or from epithelium escaping from the ovarian hematoma which might have perforated.

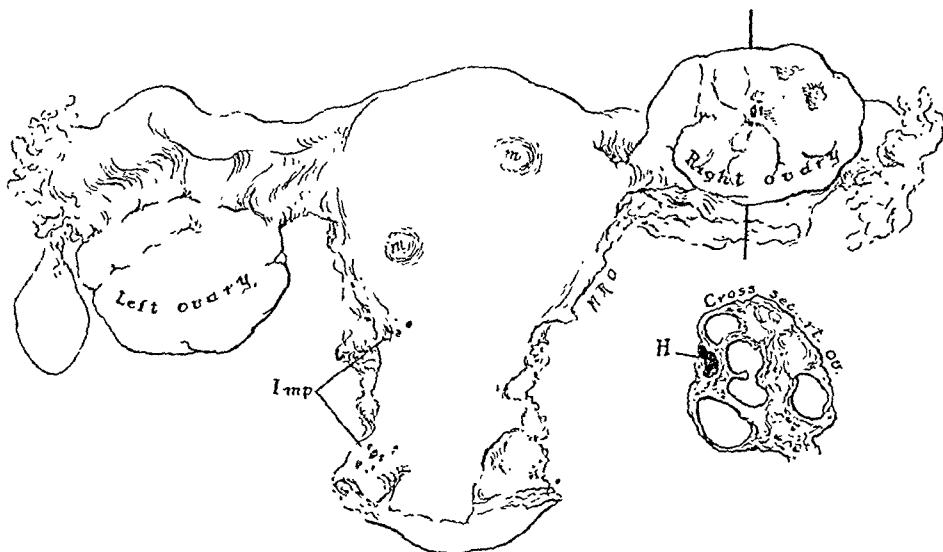


Fig. 36.—(Case 11). Hemorrhagic cyst (hematoma) of endometrial type of the right ovary; implantation adenoma (*imp.*) of the posterior surface of the uterus and both uterosacral ligaments (right one not shown in the illustration), multiple small leiomyomas of the uterus. Posterior view of the specimen removed at operation, right ovary turned upwards showing the pigmented elevation on its lateral surface; the hematoma (*H*) is also shown in the cross section of the ovary ( $\times 4/5$ ). The hematoma of the ovary might have perforated, and the implantations involving the posterior surface of the uterus and the uterosacral ligaments might have arisen from epithelium escaping from it, or from epithelium escaping from the tubes (both were patent), or from both. I believe the ovarian hematoma (Fig. 37) arose from epithelium escaping from the tubes.

foration occurs and some of the contents of the cyst escapes into the peritoneal cavity carrying with it epithelial cells which apparently give rise to implantation adenomas wherever the epithelium falls on suitable "soil." The escape of the contents of the cyst probably prolongs its life. It relieves tension and thus favors repair until the next reaction to menstruation. There is evidence that the perforation may close if it is small without the ovary or cyst becoming adherent to some other adjacent structure (Fig. 60). In the majority of cases the ovary or cyst becomes adherent to some other pelvic tissue such as the side of the pelvis, the posterior layer of the broad ligament, or the uterine wall; and these assist in sealing the perforation. In freeing the ovary or hematoma at operation the

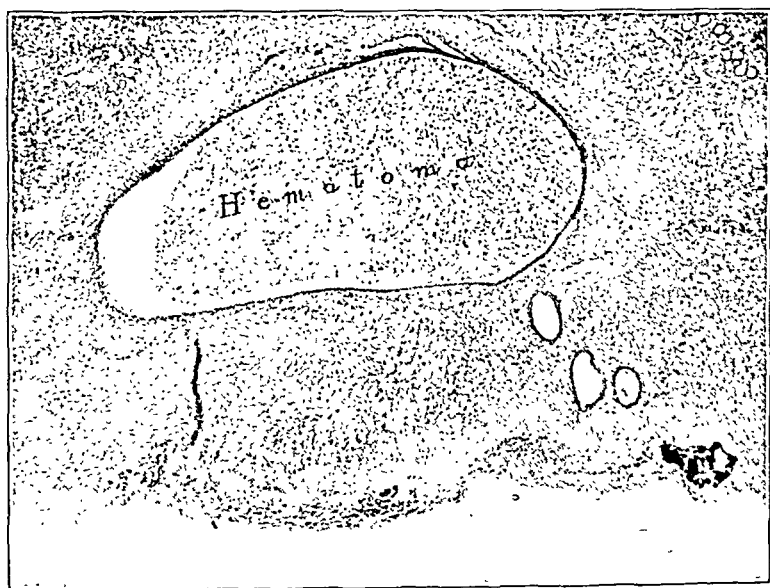


Fig. 37.—(Case 11). Photomicrograph (obj. 50 mm.) of a section of the hematoma of the right ovary (Fig. 36). The hematoma is lined by cuboidal epithelium, some of which were ciliated. A tubule of endometrial type is shown extending towards the hematoma from the surface of the ovary. I believe the hematoma arose from this tubule and the tubule from epithelium escaping from the tube and becoming implanted on the surface of the ovary; both tubes were patent. Other sections showed that the hematoma had probably perforated, as indicated in the cross section of the ovary shown in Fig. 36.

perforation is usually reopened or the healed thin wall is torn at this place as was demonstrated in the first communication.<sup>1</sup> The future life history of the perforated cyst is similar to that of the cyst before perforation; another or repeated perforations may occur, the menopause may take place before another perforation, or the epithelial lining may be completely destroyed and further reaction to menstruation cease. The perforation, in all cases which I have studied, has been situated on the lateral surface or free border of the ovary and never on its mesial surface. This would indicate that the hematomas arose from tubules which had invaded the ovarian tissues

from these surfaces, the portions of the ovary which are normally most frequently in contact with the fimbriated end of the tube (Fig. 1).

The contents of the hematomas vary, consisting of blood (menstrual), blood pigment, cast off epithelium, endothelial leucocytes, cholesterol crystals, and stroma cells, in various stages of activity and disintegration, and in various proportions, depending upon the age of the hematoma and upon the phase of the menstrual cycle in which the hematoma was removed. An ovarian hematoma may not react to

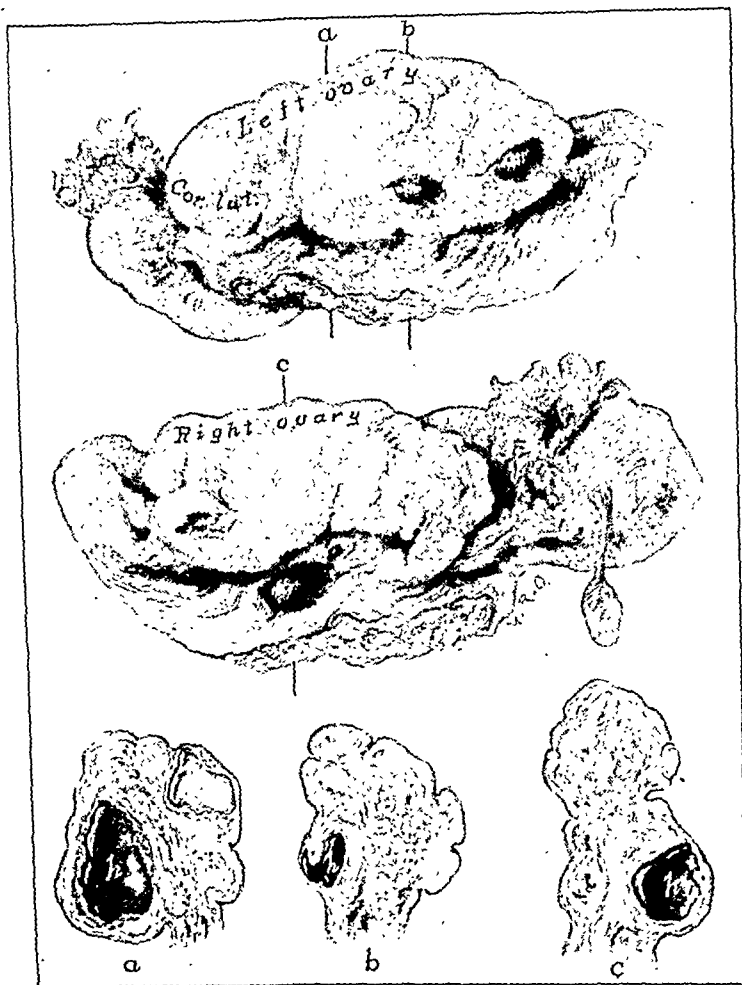


Fig. 38.—(Case 8). Multiple hemorrhagic cysts of endometrial type of both ovaries without gross evidence of perforation; small implantation adenoma in the culdesac (see Fig. 59); multiple leiomyomas of the uterus, uterine polyp. Lateral surface of both ovaries and cross sections of the ovaries showing the situations of three of the hematomas (x 1). A corpus luteum hematoma was present in the distal pole of the left ovary. Cross section (a) through the plane (a) of the left ovary shows a hematoma (h) of endometrial type, and cross section (b) through the plane (b) shows a smaller hematoma. A photomicrograph of the latter appears in Fig. 42. (c) shows a hematoma of endometrial type in the right ovary. All the hematomas were presenting towards the lateral surfaces of the ovaries, the surface which is most frequently found in contact with the fimbriated end of the tube. Both tubes were patent.

every menstrual period. The recuperation (regeneration) after menstruation is apparently slow and if the damage is great as the result of one menstrual period it may not be sufficiently recuperated to take part in the next one.

THE INFLUENCE OF PREGNANCY ON OVARIAN HEMATOMAS (HEMORRHAGIC CYSTS) OF ENDOMETRIAL (MÜLLERIAN) TYPE

As these cysts react to menstruation causing the formation of a hematoma, we would expect their epithelial lining also to react to pregnancy, just as the uterine mucosa reacts to it. The opportunities

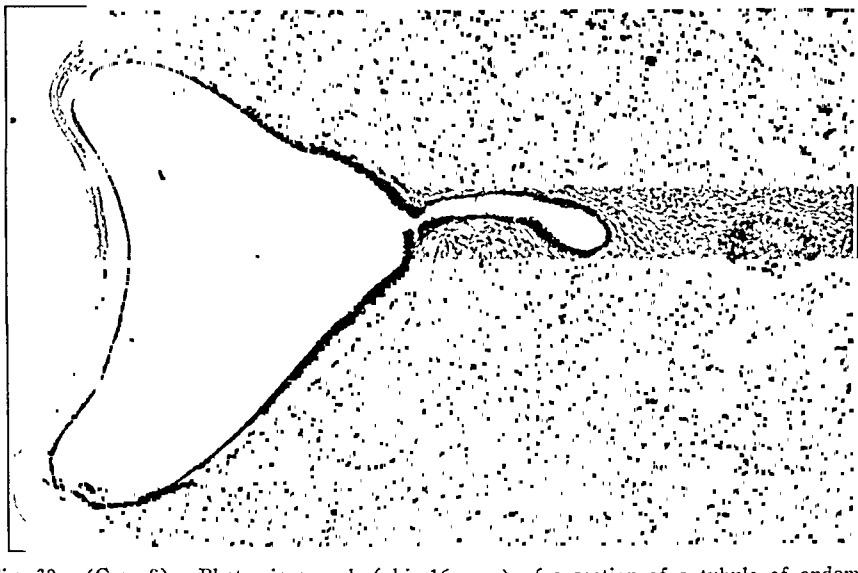


Fig. 39.—(Case 8). Photomicrograph (obj. 16 mm.) of a section of a tubule of endometrial type invading the tissues of the ovary from its lateral surface (left ovary, Fig. 38). Some of the epithelial cells were ciliated.

to study this reaction are few for several reasons. Patients with this condition rarely become pregnant, due to the ovarian lesion which is often bilateral, and to other conditions frequently associated with it which are conducive to sterility, as leiomyomas and polyps and

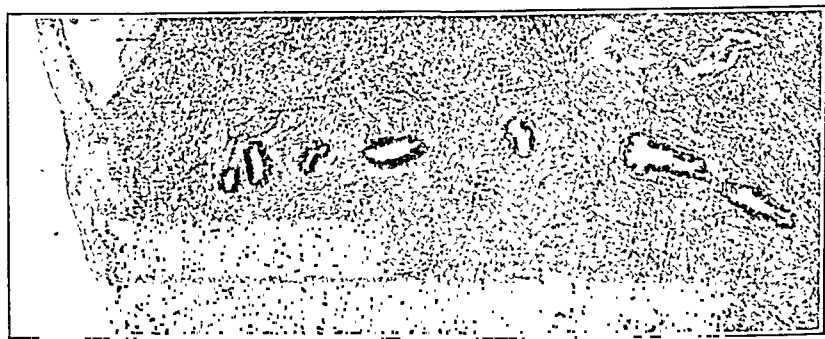


Fig. 40.—(Case 8). Photomicrograph (obj. 16 mm.) of a tubule of endometrial type invading the deeper tissues of the ovary from its lateral surface (left ovary, Fig. 38). Some of the epithelial cells were ciliated. It is from these tubules that the deeper hematomas arise, and they may reach a large size before perforation occurs.

the age of the patient, the latter part of the child bearing period. Sterility or no pregnancies in several years in married women with these ovarian hematomas is quite a common condition. Should a patient with this lesion become pregnant and the latter condition be

recognized, there would probably not be sufficient indications present to justify an abdominal operation.

I have observed only one instance of pregnancy associated with an ovarian hematoma of endometrial type. Both conditions were accidental findings (Case 14 of this series). The patient, aged 37, had been married for eleven years and had never been pregnant. Menstruation had been regular, the last flow occurring two weeks before the operation. At the operation, which was undertaken for multiple leiomyomas of the uterus, the left ovary was found to be adherent to the posterior surface of the broad ligament; in freeing it the characteristic "chocolate" like fluid escaped. The entire uterus, both tubes and ovaries and appendix were removed. An apparent implantation adenoma was present on the posterior uterine wall ad-

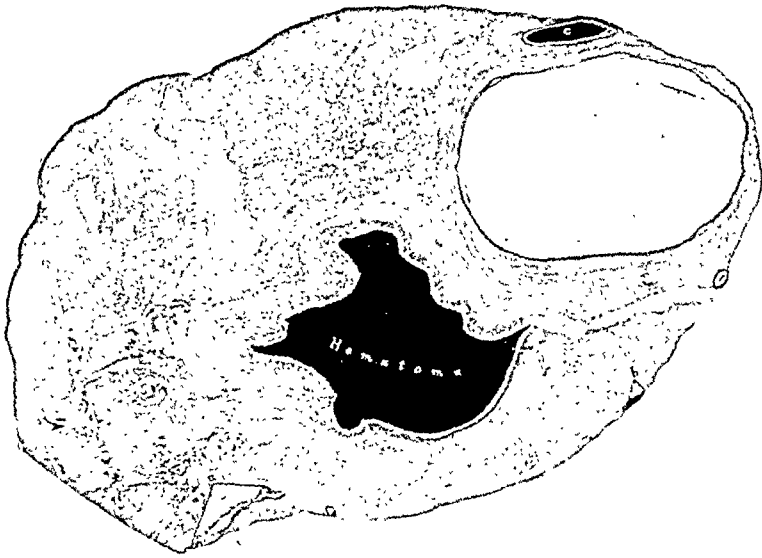


Fig. 41.—(Case 3). Cross section of the right ovary showing a hematoma (H) of endometrial type which had not perforated (x 5). The ovary was incised before it had been hardened, and some of its contents escaped; hence the walls of the hematoma are partially collapsed. The lining of the hematoma showed various stages in the reaction to menstruation; the attempt to absorb the menstrual blood, and to reline the denuded portions from epithelium which had not been cast off by menstruation (see Figs. 45, 46, 47, 48 and 50). Tissue of endometrial type was found invading the ovary at (a) from its lateral surface, and possibly the hematoma developed from a tubule arising from this tissue, which had penetrated the deep structures of the ovary. Serial sections were not made, and thus this point was not determined. Only about one quarter of the circumference of the hematoma was lined by epithelium. "b" indicates the gland with hemorrhage about it shown in Fig. 26, and "c" a small, hemorrhagic cyst lined by ciliated epithelium.

jacent to the attachment of the left broad ligament and the site of the perforation of the ovarian hematoma (Fig. 67). The gross appearance of this implantation adenoma differed from the usual ones in the absence of menstrual pigmentation. On opening the uterine cavity an early pregnancy was found, the embryo being 14 mm. long (Fig. 68). Both fallopian tubes were apparently normal and the corpus luteum of pregnancy was situated in the right ovary. The hematoma of the left ovary was lined by typical decidual tissue, with the surface epithelium still present in the depressions (Figs. 69 and



70). Histologically it was identical with that of the compact layer in the decidua vera of the pregnant uterus. Glands were not present in the lining of the ovarian hematoma. There was likewise a decidual reaction in the implantation adenoma in the posterior uterine wall. One of the dilated tubules resembled a miniature uterine cavity (Fig. 71), a portion of whose mucosa showed a definite compact and spongy layer. The reaction in the compact layer was not quite as striking as that in the wall of the ovarian hematoma, but the glands of the spongy layer had a histological structure identical with that of the glands in the spongy layer of the decidua vera of the uterine cavity (Fig. 72). Sections from three different portions of both fallopian tubes were examined microscopically and no decidual reaction was found in any.

The typical decidual reaction of pregnancy was found in the lining of cavities in three different situations of this specimen, the cavity of the uterus, the ovarian hematoma and those of the implantation adenoma of the posterior uterine wall. The uterine cavity was lined by endometrium. What was the nature of the lining of the other two? I believe it was similar to that of the uterine cavity.

#### THE INFLUENCE OF THE MENOPAUSE AND OLD AGE ON OVARIAN HEMATOMAS (HEMORRHAGIC CYSTS) OF ENDOMETRIAL (MÜLLERIAN) TYPE

As the reaction of the lining of these hematomas to menstruation and pregnancy is similar to that of the endometrium, we should expect that the menopause and old age would affect the mucosa of these hematomas, just as they affect the mucosa of the uterine cavity. I believe that this is true. In many instances the reaction of the mucosa of the hemorrhagic cysts to menstruation completely removes the epithelial lining and causes the death of the cyst before the menopause occurs. If small, the remains of the hematoma may be completely absorbed, if large, it may persist possibly for the life of the individual, the old "menstrual" blood being retained in a cyst-like cavity lined by a deeply pigmented membrane (Fig. 56).

#### PLATE IV

Fig. 42.—Plate IV (Case 8). Reproduction of a colored photomicrograph (obj. 50 mm.) of a section of the hematoma of endometrial type appearing in the cross section of the ovary shown in (b) Fig. 38. Most of the epithelial lining had been cast off by menstruation. In places it is present with an underlying hemorrhage. In one place a typical "uterine" gland (g) is present in this stroma. Cross sections are shown of what appears to be a tubule (t) which may have invaded the ovary from its lateral surface, and may have been the source of the hematoma (see also Figs. 39 and 40 from the same ovary). Some of the epithelial cells lining the hematoma were ciliated. Should perforation occur the contents of the hematoma, including epithelium cast off by menstruation, would escape into the peritoneal cavity; the latter might give rise to implantation adenomas.

Fig. 43.—Plate IV (Case 4 of second series<sup>2</sup>). Reproduction of a colored photomicrograph (obj. 4 mm.) of a portion of the wall of the ovarian hematoma shown in Fig. 62. Here the hematoma is lined by columnar epithelium (not ciliated). A cross section of a dilated thin walled blood vessel is present, with the red blood corpuscles escaping through its wall into the surrounding stroma; indicating the source of the subepithelial hemorrhage. In other sections the epithelial lining had been cast off by the underlying hemorrhage rupturing into the cavity of the hematoma.



Fig. 42

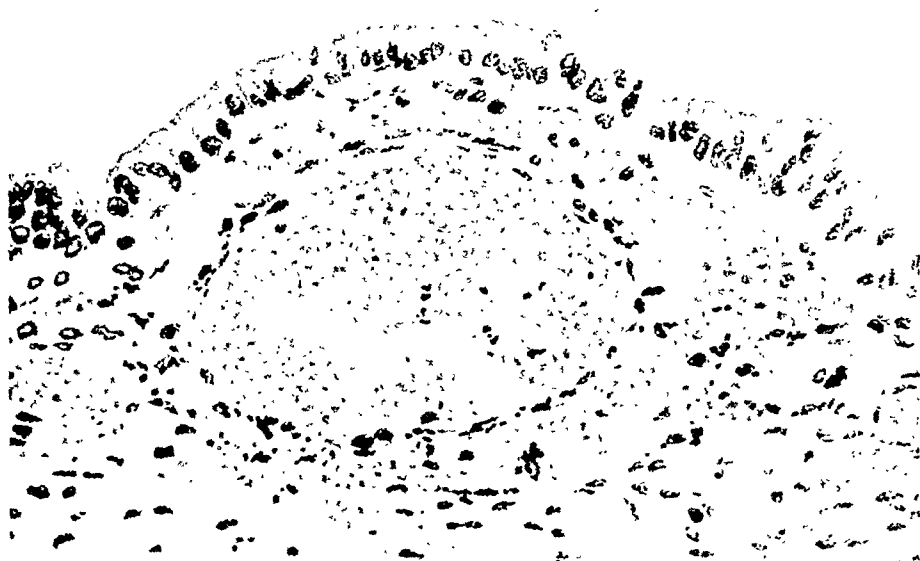


Fig. 43



I have had the opportunity to study only two cases with ovarian hematomas of endometrial type in women past the menopause. The first one occurred in a woman 61 years old (Case 6 of this series). The remains of a hematoma (Fig. 73) were found in the right ovary containing "caked" menstrual blood in a cavity lined by a wavy hyaline membrane deeply pigmented with hemosiderin. The epithelial lining had completely disappeared (Fig. 74); this had possibly occurred before the menopause. Implantation adenoma was present invading the posterior uterine wall (Fig. 75), which histologically resembled the mucosa of the uterine cavity.

The second case occurred in a woman 59 years old with carcinoma of the body of the uterus. Small ovarian hematomas of endometrial type were present in both ovaries. The epithelial lining was present in both hematomas. There was no histologic evidence of any recent reaction to menstruation. The specimen was only recently removed and I have not had an opportunity to complete its study and am not reporting it in full in this series of cases.

THE EVIDENCE THAT THESE HEMATOMAS OR HEMORRHAGIC CYSTS ARE  
OF ENDOMETRIAL (MÜLLERIAN) TYPE

They develop from glands or tubules in the ovary which are lined by cuboidal or columnar epithelium (often ciliated) resembling tubal and uterine epithelium. Hemorrhage occurs in the ovarian tissue about the glands or tubules at the time of menstruation.

The glands or tubules from which these hematomas develop are derived from epithelium which has escaped from the fimbriae, or through the lumen of the fallopian tube, and becoming implanted on the surface of the ovary has invaded its tissues. See text of this article for evidence supporting this view.

Histologically, the epithelial lining of these ovarian hematomas is similar to that of the hematomas and dilated cavities found in primary adenomyoma of the uterus and of the tube.

Every variation in the histologic structure of the lining of the ovarian hematomas (often seen in different portions of the same hematoma) is due to different phases in its reaction to menstruation, such as: the inactive stage without evidence of hemorrhage, the sub-epithelial hemorrhage, the escape of blood through the overlying epithelium carrying some of the latter with it into the cavity of the hematoma, the subsequent reaction on the part of the ovarian stroma lining the hematoma in its attempt to absorb the extravasated blood, and especially the development and activities of the endothelial leucocytes as scavengers, and finally the regeneration of the epithelial lining over the denuded portions from epithelium which had not been removed by menstruation. The perforation of the hematoma is but a result of menstruation.

Their reaction to menstruation, pregnancy and old age is similar to that of the mucosa of the uterine cavity. They develop during the menstrual life of women, and the condition found in portions of the lining of the hematoma may correspond to the phase of the menstrual cycle indicated by the menstrual history of the patient. In the only case of pregnancy associated with this condition which I have studied, the decidual reaction in the lining of the ovarian hematoma was histologically identical with that of the compact layer of the decidua vera of the accompanying uterus.

The histologic study of these hematomas shows that portions of the epithelial lining are cast off by the menstrual hemorrhage, and this epithelium may be found free in the hemorrhagic contents of the hematoma. Where perforation has occurred adenoma of endometrial type may be found on the surface of the ovary about the site of the perforation and in the other tissues adherent or adjacent to it, as well as in situations where material escaping from such a perforation would be likely to lodge. These implantation adenomas are apparently derived from material escaping from the perforation of the ovarian hematoma, and in structure are of endometrial type; often resembling normal endometrium more closely than the lining of the ovarian hematoma. If adenoma of endometrial type develops from the implantation of epithelium cast off by menstruation from the lining of the hematoma and escaping through the perforation, then the epithelial lining of the hematoma must also be of endometrial type.

#### REPORT OF CASES

In the first series of cases<sup>1</sup> reported by me, an ovarian hematoma or hemorrhagic cyst with evidence of perforation was present in each instance. The second series of cases<sup>2</sup> included those with implantation adenoma of endometrial type involving some portion of the intestinal

#### PLATE V

Fig. 44.—Plate V (Case 9). Reproduction of a colored photomicrograph (obj. 4 mm.) of a portion of the wall of the hematoma shown in Fig. 60, which is here lined by epithelium. The epithelium for the most part is low, but in a small depression it is cuboidal and ciliated. What appears to be a dilated (blood) vessel filled with endothelial leucocytes is present beneath the epithelial lining.

Fig. 45.—Plate V (Case 3). Reproduction of a colored photomicrograph (obj. 4 mm.) of a portion of the wall of ovarian hematoma shown in Fig. 41. This portion had not reacted to menstruation. The cells are cuboidal to columnar and ciliated; in places they are "heaped up" as is often found in glandular hypertrophy of the uterine mucosa, and also in the ampulla of the fallopian tube. The contents of the hematoma is shown above the epithelial lining. It consists for the most part of endothelial leucocytes engorged with red blood corpuscles and also of red blood corpuscles in various stages of preservation. For the source of the endothelial leucocytes see the next two illustrations.

Fig. 46.—Plate V (Case 3). Reproduction of a colored camera lucida drawing of a microscopic section of a portion of the wall of the hematoma shown in Fig. 41; it is reacting to menstruation (a little lower magnification than the preceding illustration). The patient was operated upon the second day of the menstrual period. The epithelium to the left is ciliated; to the right the cilia have disappeared, and the epithelium has assumed various shapes as though undergoing retrogression. Subepithelial hemorrhage is present and endothelial leucocytes have appeared, some of which are filled with red blood corpuscles. A thin-walled blood vessel is shown in longitudinal section.



Fig. 44

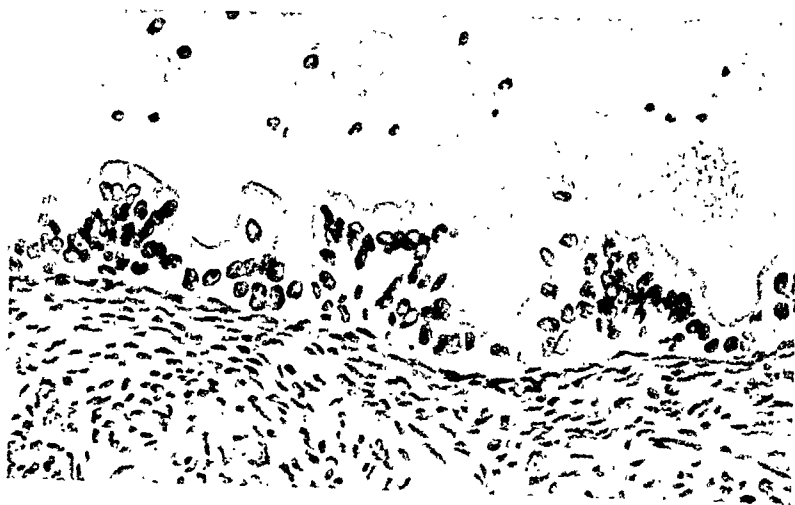


Fig. 45

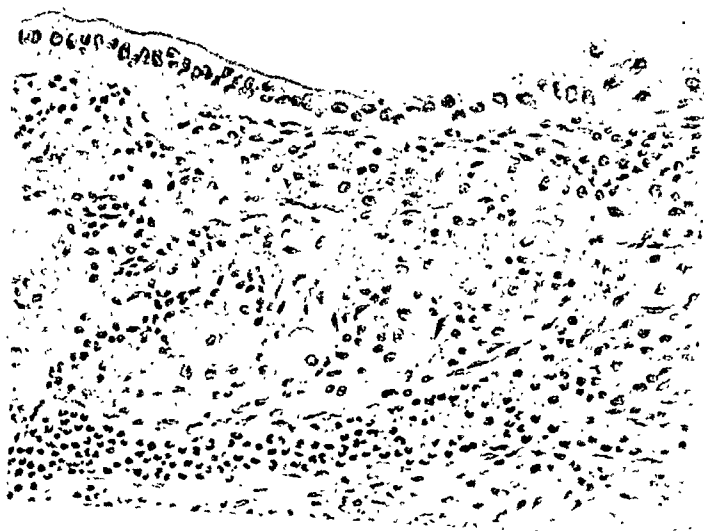


Fig. 46



tract. The cases in these two series represent, for the most part, those of long standing—namely the advanced stages of the disease.

The cases reported in the present series were chosen from those demonstrating the origin and development of ovarian hematomas of endometrial type and ovarian hematomas without perforation rather than from those with perforation and extensive implantations. A few additional cases are included which showed special features in the life history of this condition. The cases in this series represent, for the most part, the early stages of the disease, and as a whole are not of as great clinical interest as those reported in the other two series.

CASE 1.—(Case 7 of the first series).<sup>1</sup> *Multiple hematomas (of endometrial type) of both ovaries (some had perforated), adhesions between the ovaries and the posterior uterine wall (implantation adenoma not found), small leiomyomas of the uterus.* Mrs. X. W., aged thirty-five, complained of uterine bleeding which had occurred six times in the last twelve weeks. She had never been pregnant. Menstruation had been regular, moderate and normal until the last three months. Since then it had been more profuse and frequent and had been accompanied with pain. Pelvic examination showed the uterus to be slightly enlarged, irregular in consistency, with an "inflammatory" mass on either side. The preoperative diagnosis was a myomatous uterus with bilateral "chronic pelvic peritonitis." Operation was at the Albany Hospital, Nov. 10, 1918. Both ovaries were cystic and adherent to the posterior surface of the uterus and broad ligaments. Small leiomyomas were present. On freeing the ovaries a small amount of chocolate fluid escaped. The appendix, both tubes and ovaries and the entire uterus were removed (Fig. 52). The tubes appeared normal. Both ovaries contained multiple hematomas in various stages of development and retrogression; most of them had not perforated. At the time of the previous communication<sup>1</sup> I believed that some of these hematomas represented various stages in the life cycle of corpus luteal hematomas. I have restudied this specimen and with my present knowledge recognize that all of the hematomas represent various stages in the life history of hematomas of endometrial type. Many sections were studied from both ovaries (nearly all the tissue in both ovaries has been examined histologically). Adenoma of endometrial type (Fig. 53) was found on the surface of both ovaries, which invaded the ovarian tissue in the form of tubules. These tubules were found throughout the entire substance of both ovaries and one could trace the development of the hematomas from these tubules (see Figs. 54 and 55). The patient made a satisfactory convalescence.

CASE 2.—*Hematoma (of endometrial type) of the right ovary without evidence of perforation or implantations in the pelvis.* Mrs. W. N., aged twenty-eight, complained of sterility and painful menstruation. She had been married seven years and had never been pregnant. Menstruation began at the age of thirteen and had always been painful. The pain began with the flow and was worse the second day. It had increased in severity the last year and was more marked on the right side. The last flow occurred four weeks before the operation. Pelvic examination showed that the uterus was small, in normal position and freely movable. The right ovary seemed enlarged and very tender. The preoperative diagnosis was a cystic right ovary. Operation was at the Albany Hospital July 31, 1920. The right ovary was cystic, about twice the normal size, and slightly adherent. Otherwise the pelvic organs appeared normal. The cyst (retention) of the right ovary was excised, and in doing this a small hematoma about 5 mm. in diameter was noticed near the lateral surface of the ovary; this was also excised. The appendix had been removed



ten years ago. The cervix was dilated, and a stem pessary introduced. The small hematoma was lined in part by cuboidal epithelium. The rest of the hematoma was lined by a pigmented layer of ovarian tissue composed for the most part of endothelial leucocytes. Histologically the lining of the hematoma was similar to that of other hematomas of endometrial type described in this communication. The patient made a satisfactory convalescence.

*CASE 3.—Hematomas (of endometrial type) of both ovaries, without evidence of perforation or implantations in the pelvis, uterine polyp, multiple leiomyomas and descensus of the uterus, weakened pelvic floor.* Mrs. C. L., aged thirty-six, complained of descensus of the uterus and profuse menstruation. She had one child nine years old and one miscarriage a year later. Menstruation had been prolonged and profuse for the last year. The patient was menstruating the day of the operation. Pelvic examination showed a weakened pelvic floor, uterus irregularly enlarged and in descensus. The preoperative diagnosis was a weakened pelvic floor, descensus of the uterus and multiple small leiomyomas.

Operation was at the Albany Hospital March 22, 1921. The uterus was found to be irregularly enlarged by multiple small leiomyomas. The left ovary was of normal size and contained a reddish pigmented elevation about 4 mm. in diameter on its lateral surface. A similar but smaller elevation was present on the mesial and also on the lateral surface of the right ovary near its free border. Adhesions were not present in the pelvis nor was there any gross evidence of any implantations. (The pelvis was examined very carefully for both.) The appendix, both tubes and ovaries and the body of the uterus were removed. The cervix was sutured into the abdominal incision and the pelvic floor was repaired. The uterus contained several small leiomyomas, the largest being 3.5 cm. in diameter. A small polyp was also present in the fundus of the uterus. The left ovary contained on its lateral surface a superficial hematoma about 4 mm. in diameter which was lined by low to cuboidal epithelium; many of the epithelial cells were ciliated. Three similar superficial hematomas were present in the right ovary, the smallest being about 0.5 mm. (Fig. 26) and the largest 4 mm. in diameter. A larger, deep hematoma, about 1 cm. in diameter was situated in the right ovary which had not ruptured but was presenting towards its lateral surface (Fig. 41). This hematoma was partly lined by epithelium which in places was ciliated; subepithelial stromal hemorrhages were also present (Figs. 45 and 46). The greater portion of this hematoma was lined by a pigmented layer of ovarian tissue without an epithelial covering, the pigment, the result of previous hemorrhage, being for the most part in cells of the type of endothelial leucocytes (Figs. 47 and 48). The superficial hematomas could have arisen

## PLATE VI

Fig. 47.—Plate VI (Case 3). Reproduction of a colored photomicrograph (obj. 16 mm.) of a portion of the wall of the hematoma (H) Fig. 41, showing endothelial leucocytes escaping into the cavity of the hematoma, and the formation of the pigmented lining. To the right, the epithelial lining is still present with an underlying stromal hemorrhage. In the center, endothelial leucocytes have developed and are pouring into the cavity of the hematoma through a breach; probably caused by a previous subepithelial hemorrhage rupturing into the cavity of the hematoma, and carrying the overlying epithelium with it (see also Fig. 50). To the left, the luteal-like pigmented layer is forming which is composed, for the most part, of endothelial leucocytes containing blood pigment. The contents of the cavity of the hematoma (above) consists of blood and endothelial leucocytes, epithelium and stroma cells in various stages of preservation.

Fig. 48.—Plate VI (Case 3). Reproduction of a colored photomicrograph (obj. 16 mm.) of a portion of the wall of the hematoma (H) Fig. 41, showing the pigmented layer lining the greater portion of the hematoma. This represents a later stage of the condition shown in the preceding illustration. The endothelial leucocytes are breaking down, and hyaline connective tissue has developed in the stroma of the wall of the hematoma.

Fig. 49.—Plate VI (Case 9). Reproduction of a colored photomicrograph (obj. 16 mm.) of a portion of the wall of the ovarian hematoma shown in Fig. 60. This demonstrates very well the breaking down of the endothelial leucocytes in the superficial portion of the wall of the hematoma, and the deposit of blood pigment in the deeper tissues.



Fig. 47

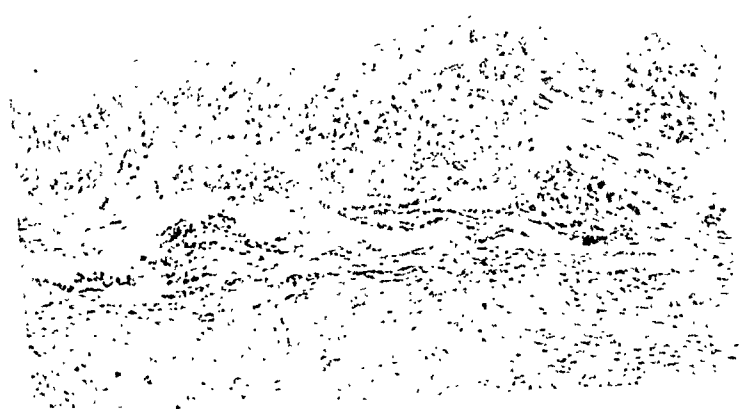


Fig. 48



Fig. 49



from implantations of epithelium derived from or through the tube, while the deeper one could have arisen from tubules penetrating the ovary from its surface. Perforation or rupture of these hematomas might give rise to implantation adenoma wherever epithelium carried with the material escaping into the pelvis might fall on suitable "soil." The patient made a satisfactory convalescence.

CASE 4.—*Multiple small implantation adenomas (of endometrial type) of the posterior surface of the uterus, posterior culdesac, anterior surface of the left broad ligament and in the anterior culdesac, leiomyoma of the uterus, evidence of stromal hemorrhage in the right ovary.* Mrs. D. B., aged forty-six, complained of uterine bleeding. She had been married for eleven years and had never become pregnant. Menstruation had been regular, normal and without pain. For the last two months there had been a more or less constant bloody uterine discharge, at times quite profuse. Pelvic examination showed that the uterus was irregularly enlarged and

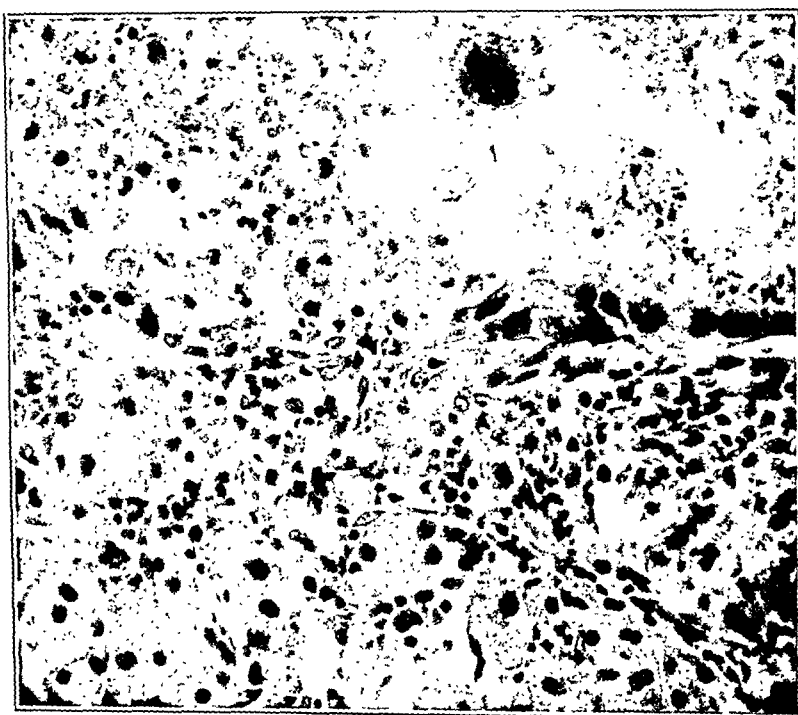


Fig. 50.—(Case 3). Photomicrograph (obj. 4 mm.) of a portion of the wall of the ovarian hematoma shown in the center of Fig. 47. The endothelial leucocytes are escaping into the cavity of the hematoma through a breach in the overlying epithelium; probably caused by a previous hemorrhage (menstrual).

freely movable. The preoperative diagnosis was uterine leiomyoma and -possibly carcinoma of the body of the uterus.

Operation was at the Albany Hospital May 6, 1921. Implantation adenoma was found as described above (Fig. 10). The appendix, both tubes and ovaries and the entire uterus were removed. Multiple small leiomyomas were found, the largest being 3 cm. in diameter. Carcinoma of the body of the uterus was not present. The implantations were of endometrial type. A small pigmented area 3 mm. in diameter was present on the lateral surface of the right ovary. Histologically this pigmentation was due to old blood pigment in the cells of the ovarian stroma; glands or tubules of endometrial type were found neither in this area, nor in any of the sections taken from both ovaries. This area may represent the remains of a small ovarian hematoma of endometrial type in which all of the epithelium had

been destroyed by menstruation and perforation. The tubes appeared normal, and there were not any pelvic adhesions present. I believe the implantations probably arose from epithelium escaping from the tubes, although the possibility of implantations from a small ovarian hematoma which had disappeared after perforation cannot be excluded. The patient made a satisfactory convalescence.

CASE 5.—*Superficial small hematomas (of endometrial type) of both ovaries without gross evidence of perforation and of implantation adenomas in the pelvis, retroflexed uterus, appendicitis with abscess.* Mrs. J. C., aged twenty-three, complained of attacks of pain in the right side of the abdomen. She had not had any children but had had one miscarriage a year and a half ago. Menstruation was moderate in amount, and had always been painful. The patient was menstruating the day of the operation. The first attack of pain in the right side of the abdomen occurred five months before her operation; she was in bed a week at that time. The last attack occurred twelve days before the operation; she was in bed five days, had nausea, vomiting and elevation of temperature. Abdominal palpation showed

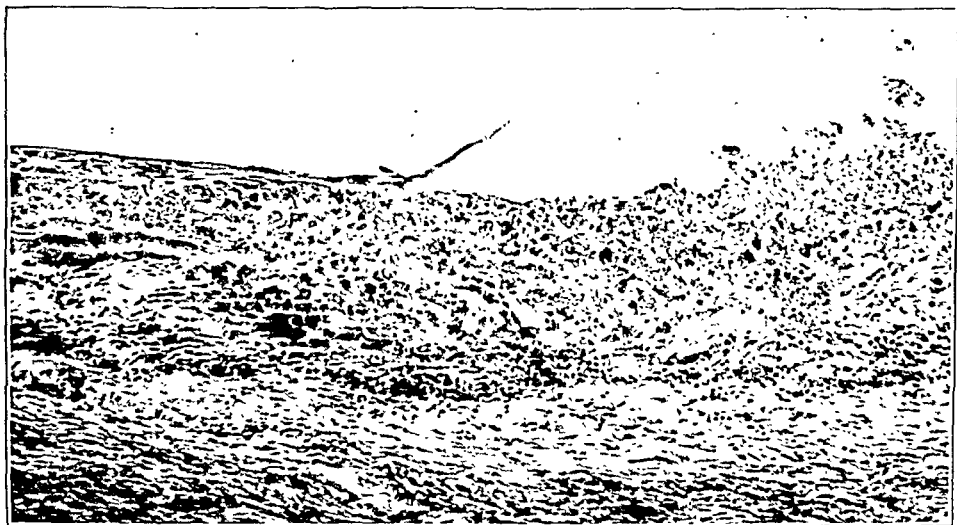


Fig. 51.—(Case 9). Photomicrograph (obj. 16 mm.) of a portion of the wall of the ovarian hematoma present in Fig. 60, showing the flattened epithelium to the left "riding" over the pigmented layer, which is composed mostly of endothelial leucocytes undergoing retrogression. This represents the relining of the denuded portion of the hematoma, from epithelium not cast off by menstruation (from the same section shown in Fig. 44). The retrogression of the endothelial leucocytes is well demonstrated in Fig. 49; also from the same specimen but another section.

marked tenderness and resistance over the region of the cecum. Pelvic examination showed a retroflexed uterus. The preoperative diagnosis was appendicitis and retroflexion of the uterus. Operation was at the Albany Hospital May 9, 1921. A median incision was made; the uterus was retroflexed. On replacing it and examining the ovaries, multiple superficial hematomas from 1 to 2 mm. in diameter were noticed on the lateral surface of the right ovary and a similar hematoma about 3 mm. in diameter on the lateral surface of the left ovary (Fig. 2). The right tube and ovary were removed; the portion of the left ovary containing the hematomas was excised. The uterus was suspended by suturing the round ligaments to its posterior surface. A small abscess was found about the appendix lateral to the cecum. The appendix was removed and the seat of the abscess was drained by a protective wick drain through a small McBurney incision. No gross evidence of implantation adenomas was found in the pelvis. Histologically, the small ovarian hematomas were of endometrial type with a definite reaction to menstruation, which had car-

ried some of the overlying epithelium into the cavities of the hematomas (Figs. 28 and 29). Should perforation occur some of this epithelium would escape with the contents of the hematoma into the pelvis, and might give rise to implantation adenomas. Both tubes were patent and the hematomas on the surface of the ovaries probably arose from epithelium escaping from the tubes. The patient made a satisfactory convalescence.

CASE 6.—*Hematoma of endometrial type (perforated) of the right ovary, implantation adenoma (of endometrial type) of the posterior uterine wall, multiple small leiomyomas, uterine polyp, adherent retroflexed uterus. Mrs. L. B., aged sixty-one, complained of indigestion and loss in weight. She had four children, the youngest being thirty-two years old. Menopause occurred at the age of forty-eight*

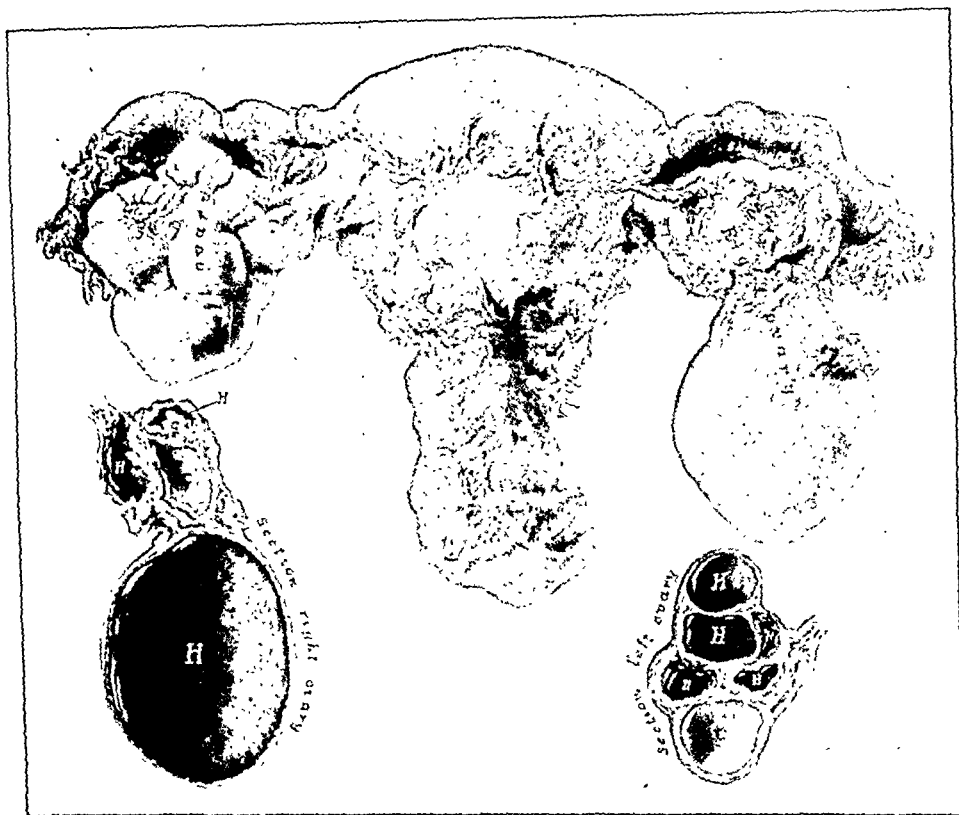


Fig. 52.—(Case 1). Multiple hematomas of endometrial type, in various stages of development and retrogression, of both ovaries. Posterior view of the uterus, tubes and ovaries removed at operation ( $\times 2/3$ ); both ovaries also shown in cross section. The hematomas are marked "H" in the cross sections of the ovaries and a follicular cyst "C" is shown in each ovary. All the hematomas were of endometrial type. Implantation adenoma of endometrial type was found on the surface of both ovaries, invading the underlying tissues (Fig. 53); tubules of endometrial type were found in the deeper tissues of the ovary and hematomas arose from these just as the superficial hematomas developed (Fig. 54 compare with Fig. 37). As the hematomas became larger the typical pigmented lining developed in the portion of the wall where the epithelium had been cast off by menstruation. In some of the hematomas all of the epithelium had been cast off, and the hematoma was completely lined by the pigmented layer; and I believe that the life of the hemorrhagic cyst had ceased, and eventually the remains might be absorbed (Figs. 55 and 56). In some of the hematomas quite typical "endometrial" tissue was present (Fig. 57), and in others tubules were found communicating with the lining of the hematoma, and extending into or from the ovarian tissue (Fig. 58). Both tubes were patent, and while adenoma was found on the surface of both ovaries, none was found on the posterior surface of the uterus.

and was normal in character. She had lost forty pounds in weight in the last two years without any definite symptoms other than slight indigestion and constipation ("always constipated"). X-rays of the gastrointestinal tract were negative. Ab-

dominal palpation was also negative. Pelvic examination showed an adherent retroflexed uterus with marked induration in the culdesac. Rectal palpation confirmed the above and I remarked that if the patient had not passed the menopause I would make a diagnosis of implantation adenoma of endometrial type in the culde-

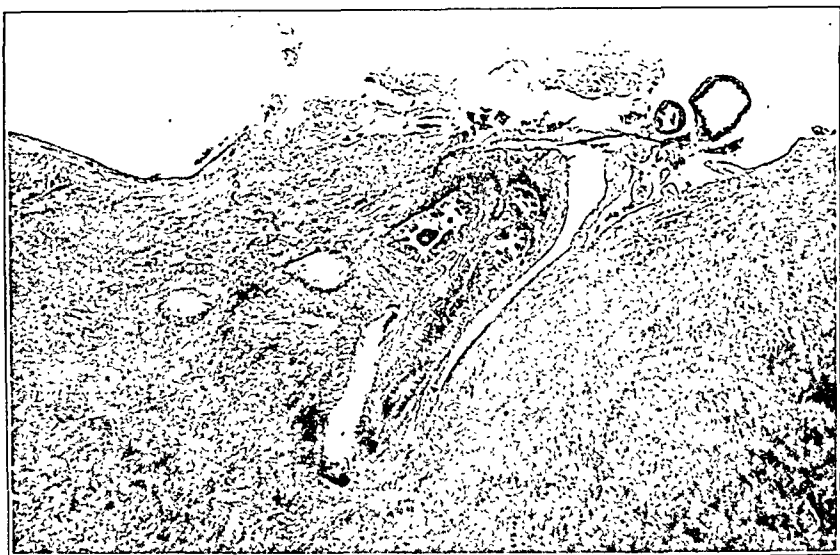


Fig. 53.—(Case 1). Photomicrograph (obj. 50 mm.) showing adenoma of endometrial type on the surface of the ovary and invading the underlying tissue as tubules.

sac. The preoperative diagnosis was probably carcinoma (primary source not determined) with implantations in the culdesac. An exploratory operation was suggested but it was not urged as I did not believe that it would be of any great benefit to the patient. Operation was at the Albany Hospital June 22, 1921. A median ab-

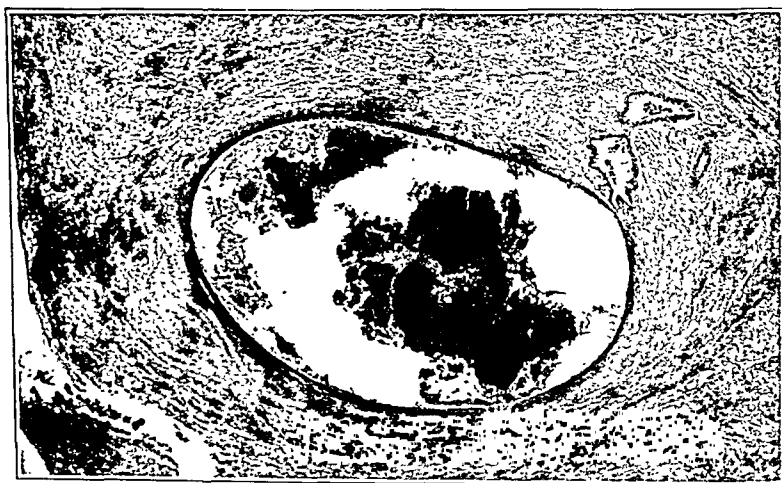


Fig. 54.—(Case 1). Photomicrograph (obj. 50 mm.) showing a small hematoma which has arisen from a dilated portion of a tubule, similar to the tubules invading the ovary from the adenoma on the surface (Fig. 53 compare with Fig. 37).

dominal incision was made and the contents of the abdominal cavity were carefully palpated and nothing abnormal was detected. The appendix was removed. The uterus was found to be retroflexed and densely adherent to the bottom of the culde-

sac. The left tube and ovary were normal. The right tube appeared normal but the right ovary was cystic, about 4 cm. in diameter, and densely adherent to the side of the pelvis. On freeing the ovary the walls of the cyst were torn, and thick "chocolate-like" paste escaped with hard "caked" pieces of material similar to the paste. The entire uterus and both tubes and ovaries were removed. The uterus contained multiple small leiomyomas, a polyp, and adenoma of endometrial type of the posterior uterine wall, which had apparently invaded the uterus from its peritoneal surface (Figs. 73 and 74). Histologically the glandular elements of this adenoma were similar to that of the mucosa lining the uterine cavity. The wall of the ovarian hematoma was thin. Many sections were made from different portions of the wall of the hematoma. Every section showed a similar condition; a stroma consisting of wavy hyaline bands of tissue without cellular elements, and scattered through it old blood pigment (Fig. 75, compare with Figs. 48 and 49). An epithelial lining was not found. I believe that the ovarian hematoma represents the remains of a larger hematoma of endometrial type in which the epithelial lining had been destroyed and the hemorrhagic contents had never been completely absorbed. The



Fig. 55.—(Case 1). Photomicrograph (obj. 50 mm.) of a section of a small hematoma of endometrial type. To the left the epithelial lining is replaced by a thick pigmented layer, the result of previous hemorrhage. The rest of the hematoma, shown in this section, is lined by epithelium mostly cuboidal. In places subepithelial hemorrhage is present.

patient made a satisfactory convalescence and feels much better than before the operation.

**CASE 7.**—*Multiple small superficial hematomas (of endometrial type) of both ovaries with evidence of perforation, corpus luteum hematoma of the right ovary; implantation adenoma (of endometrial type) involving the posterior wall of the uterus and the culdesac, leiomyomas, uterine polyps, weakened pelvic floor and gallstones.* Mrs. I. B., aged forty-three, complained of uterine bleeding, indigestion and a sense of lack of support. She had one child twenty years old, the only pregnancy. Menstruation had recently been very profuse and irregular, occurring every two to three weeks, and was not accompanied by any pain. The last menstrual flow occurred eighteen days ago and she expected to menstruate any day. Occasionally there was slight bleeding independent of menstruation. She was not constipated. Pelvic examination showed a weakened pelvic floor, the uterus to be retroverted and slightly enlarged, with some induration in the culdesac. The pre-operative diagnosis was a weakened pelvic floor, leiomyoma of the uterus, and possible implantation adenoma in the culdesac.



Operation was at the Albany Hospital June 30, 1921. The appendix, both tubes and ovaries and the entire uterus were removed. The gall bladder (gallstones) was excised and the pelvic floor was repaired. The left ovary contained two hematomas of endometrial type, 2 and 4 mm. in diameter, presenting on the lateral surface of the ovary near its free border. The larger one of these had possibly perforated. The right ovary contained several superficial hematomas of endometrial type from 1 to 2 mm. in diameter, all presenting on its lateral surface (Fig. 33). Some of these had perforated (Fig. 30). Cilia were present on some of the epithelial cells lining these hematomas. A typical corpus luteum hematoma 1.3 cm. in diameter was present in the right ovary. Adenoma of endometrial type was found invading the posterior wall of the uterus, especially marked near the left ovary (Figs. 33 and 34). Similar adenoma was also found in the culdesac. What is the relation between the hematomas of the ovaries and the adenomas invading the posterior wall

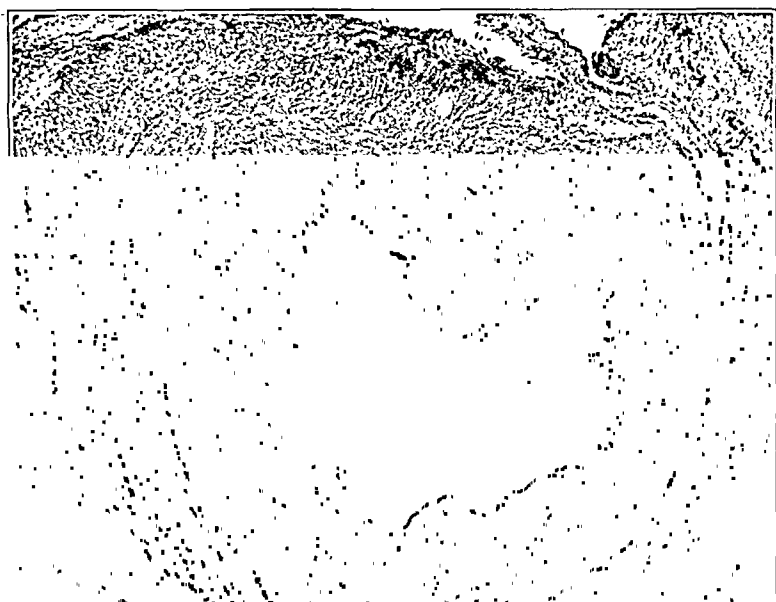


Fig. 56.—(Case 1). Photomicrograph (obj. 50 mm.) of a section of the remains of a hematoma of endometrial type, in which all of the epithelial lining has been cast off and is replaced by a thick pigmented wall similar to that shown in Fig. 55. I believe that the life of the hemorrhagic cyst, as such, had ceased.

of the uterus and the culdesac? Epithelial cells escaping from the perforated ovarian hematomas could have given rise to other implantations on the surface of the ovaries, and to the adenoma in the culdesac and uterine wall. They all could have had a common origin from epithelium escaping from the tubes. I believe that in this case implantations occurred from both sources. The primary implantations occurred from the tubes which were patent with free fimbriae. The perforating ovarian hematomas from time to time would expel into the pelvis, epithelium which might lodge on the surface of the ovaries or the posterior surface of the uterus, or in the culdesac. Implantations in various stages of development were found in all these situations. The uterine cavity contained multiple polyps. The patient died on the third day with symptoms of a severe infection and beginning pneumonia of the right lung but no signs of peritonitis. An autopsy was refused but immediately after death a blood culture was obtained by inserting a long hypodermic needle into the heart. A pure culture of pneumococcus Type II was obtained.

CASE 8.—*Multiple hematomas (of endometrial type) of both ovaries without gross evidence of perforation, small implantation adenoma (of endometrial type) in the culdesac, multiple leiomyomas, retroflexion of the uterus, weakened pelvic floor and hemorrhoids.* Mrs. M. L. H., aged fifty-one, complained of a sense of lack of support, indigestion and hemorrhoids. She had had one child eighteen years ago. Menstruation was regular, without pain and usually profuse in amount. The last flow occurred two weeks before the operation. Pelvic examination showed a weakened pelvic floor and the uterus to be irregularly enlarged and retroflexed. The pre-operative diagnosis was multiple leiomyomas in a retroflexed uterus, and a weakened pelvic floor. At the operation at the Albany Hospital, Sept. 21, 1921, the uterus was found to be irregularly enlarged and freely movable. Both ovaries contained multiple small hematomas, but were not adherent. A small, thickened area, with a pigmented elevation about 2 mm. in diameter was detected in the culdesac (Fig. 59). This was excised and proved to be an adenoma of endometrial type. The appendix, both tubes and ovaries and the entire uterus were removed. The pelvic floor was repaired and the hemorrhoids were removed by the clamp and cautery.



Fig. 57.—(Case 1). Photomicrograph (obj. 16 mm.) of a section of a portion of the walls of one of the larger hematomas of endometrial type, shown in the cross section of the left ovary (Fig. 52). Histologically it resembles uterine mucosa.

Tubules of endometrial type were found invading both ovaries from their lateral and free surfaces. Three hematomas of endometrial type were present in the left ovary, the largest being about 1.7 cm. in diameter and the smallest about 5 mm. in diameter. Two of the hematomas apparently had not perforated, but one possibly had (Fig. 38). A corpus luteum hematoma was also present in the left ovary. All three hematomas were presenting on the lateral surface of the ovary. The right ovary contained two hematomas also unruptured, the largest being about 1 cm. in diameter. The uterus contained multiple leiomyomas, the largest being about 4 cm. in diameter. For the description of the ovarian hematomas see Figs. 38, 39, 40 and 42, with their legends. The tubules of endometrial type in the ovaries from which the hematomas had developed apparently arose from epithelium invading the ovaries from their surface, and could have been implanted from epithelium arising from or escaping through the fimbriated extremity of the tube. The implantation in the culdesac could have arisen from epithelium escaping from a small perforation in one of the ovarian hematomas (Fig. 42), or could have arisen from epithelium escaping from the tube, just as I believe the ovarian hematomas arose. Both tubes were apparently normal and patent. I believe that perforation of the hematomas would be followed by further implantations. The patient made a satisfactory convalescence.

CASE 9.—*Hematoma (of endometrial type) of the left ovary with healed perforation, implantation adenoma of endometrial type on the posterior surface of the right broad ligament at its uterine attachment, small leiomyomas and early carcinoma of the uterine cervix.* Mrs. G. S., aged forty-two, complained of uterine bleeding. She had two children, thirteen and nine years of age respectively. Menstruation was regular, quite profuse and occasionally accompanied with slight pain. She had been bleeding for five weeks prior to the operation. Pelvic examination showed that the cervix was lacerated and bled slightly on palpation; the uterus was enlarged and firm in consistency. The preoperative diagnosis was probably myofibrosis of the uterus. Preliminary curettage was advised to exclude the possibility of an early carcinoma of the uterine cervix. The uterus was curetted and a small piece of the cervix was excised under nitrous oxide anesthesia. The material removed did not suggest carcinoma in its gross appearance, but histologically typical squamous cell carcinoma was found in one fragment of the tissue



Fig. 58. —(Case 1). Photomicrograph (obj. 16 mm.) of a section of a portion of the wall of one of the larger hematomas of endometrial type, shown in the cross section of the left ovary (Fig. 52) (not from the hematoma shown in the preceding illustration). This portion of the hematoma is lined by tissue resembling uterine mucosa. A tubule is shown in longitudinal section, apparently invading the underlying ovarian tissue from the lining of the hematoma; or possibly the hematoma developed from this tubule. Less than one-third of the hematoma was lined by epithelium. The greater portion of the hematoma was lined by a thick pigmented wall similar to that shown in the previous illustrations.

removed. The patient was persuaded, with difficulty, to consent to a radical operation. On October 20, 1921, at the Albany Hospital, the entire uterus, left tube, and ovary and appendix were removed. The patient was insistent that some ovarian tissue should be saved if possible and the right tube and ovary, which appeared normal, were not removed. The left ovary, which was lightly adherent to the posterior surface of the broad ligament, contained a hematoma of endometrial type, about 2.5 cm. in diameter, which had apparently perforated on its lateral surface (Fig. 60). Adenoma of endometrial type was also present on the surface of the ovary, about the healed perforation (probably implantations from the perforation). Tubules of endometrial type were present in the ovarian tissue near the

attachment of its lateral surface to the broad ligament. Implantation adenoma of endometrial type was present on the posterior surface of the left broad ligament, at its uterine attachment (Fig. 60). The ovarian hematoma could have arisen from epithelium escaping from the tube. The implantation on the surface of the broad ligament could have arisen from the tube, or through the perforation of the ovarian hematoma adjacent to it. I believe more likely the latter. The patient made a satisfactory convalescence.

CASE 10.—*Small hematoma of endometrial type of the left ovary (perforated?), implantation adenoma of the posterior wall of the uterus, multiple leiomyomas uterine polyp.* Miss E. T., aged forty-one, complained of prolonged, profuse menstruation. Menstruation had been prolonged and profuse for three years, sometimes lasting two or three weeks. It was not accompanied by any pain. The last flow occurred three weeks before the operation. Pelvic examination showed the uterus to be irregularly enlarged and freely movable. The preoperative diagnosis was multiple leiomyomas of the uterus. At the operation at the Albany Hospital,

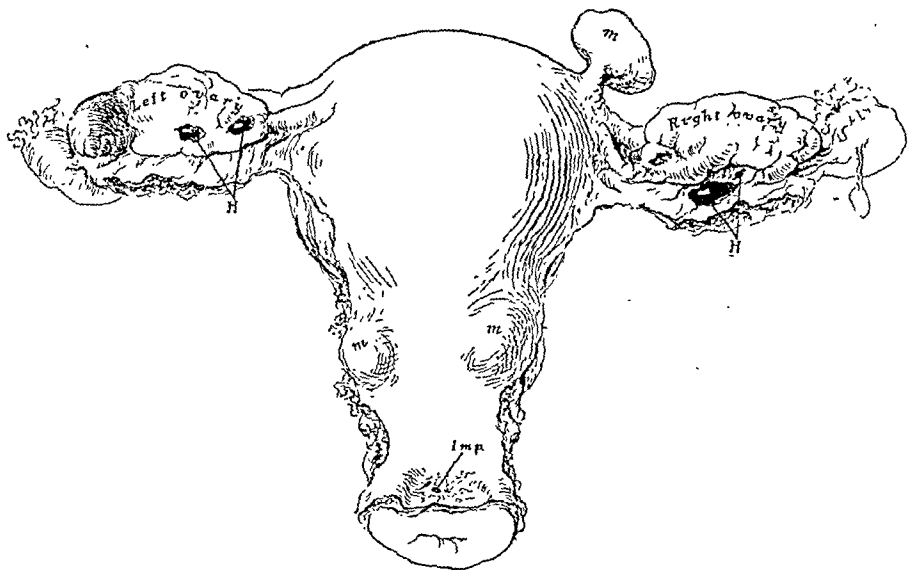


Fig. 59.—(Case 8). Multiple hematomas of endometrial type, in various stages of development, of both ovaries without gross evidence of perforation. Small implantation adenoma of endometrial type in the culdesac. Posterior view of the specimen removed at operation ( $\times 1/2$ ); both ovaries turned upwards exposing their lateral surfaces, and showing the hematomas presenting on this surface. I believe that the ovarian hematomas arose from epithelium escaping from the tubes, becoming implanted on the lateral surfaces of the ovaries and invading the underlying tissues of tubules (See Figs. 1, 38, 39, 40 and 42). The adenoma in the culdesac (*imp.*) may also have arisen from epithelium escaping from the tubes, or from epithelium escaping through the perforation of a small ovarian hematoma which was overlooked. The perforation of the ovarian hematomas would probably be followed by implantation adenoma wherever the contents of the hematoma lodged on suitable soil (compare with Figs. 60, 61 and 62 where perforation has occurred).

November 9, 1921, the uterus was found to be irregularly enlarged by multiple leiomyomas, the largest myoma being about 4 cm. in diameter. The entire uterus and both tubes and ovaries were removed. (The appendix had been removed at a previous operation.) The left ovary was cystic, of normal size, and lightly adherent to the posterior surface of the uterus (Fig. 35). There was a small, pigmented elevation about 3 mm. in diameter on the lateral surface of the ovary, which histologically proved to be a cyst-like cavity filled with pigmented material, the remains of an old hemorrhage, and without an epithelial lining. I believe it represents a small cyst of endometrial type in which the epithelial lining has been destroyed. Implantation adenoma of endometrial type was found invading the

posterior surface of the uterus lateral to the left ovary. Both tubes were apparently normal and patent. Two possible sources suggest themselves for the origin of the adenoma on the posterior surface of the uterus—one, the ovarian hematoma which had perforated (adhesions about the ovary), and in which later the perforation had become closed, and the other from epithelium escaping from the tube. The patient made a satisfactory convalescence.

CASE 11.—*Small superficial hematoma (of endometrial type) of the right ovary (perforated?); implantation adenoma of the posterior surface of the uterus and the utero-sacral ligaments; multiple small leiomyomas, retroversion of the uterus.* Mrs. N. M., aged twenty-nine, complained of very severe dysmenorrhea. She had been married twelve years, and had never been pregnant. Menstruation began at twelve

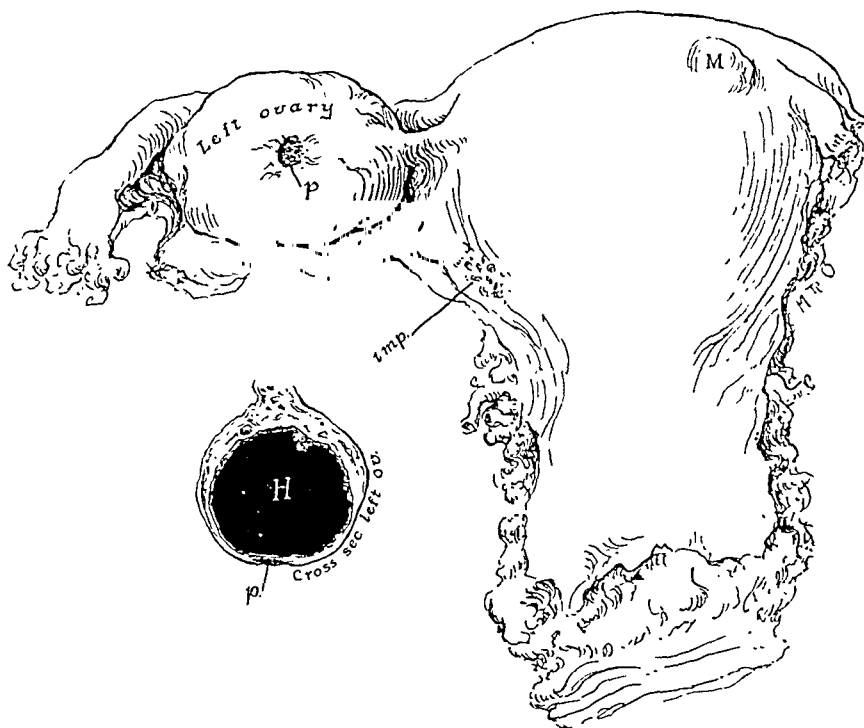


Fig. 60.—(Case 9). Hematoma of endometrial type of the left ovary with evidence of small perforation, implantation adenoma of endometrial type (imp.) on the posterior surface of the left broad ligament, near the perforation of the ovarian hematoma; early cancer of the uterine cervix. Posterior view of the specimen removed at operation ( $\times 3/4$ ); left ovary turned upwards, exposing the perforation (p), on the under surface of the ovary, which had healed over. Photomicrographs of portions of the wall of the ovarian hematoma are shown in Figs. 44, 49 and 51. Adenoma was present on the surface of the ovary about the perforation, and also on the posterior surface of the broad ligament (imp.) adjacent to it. I believe that all of these could have resulted from epithelium escaping through the perforation of the hematoma, although their origin from epithelium escaping from the tubes cannot be excluded.

years of age, always painful but more so the last three years, and increasing in severity. Menstruation lasted two to three days and was scanty in amount. Pain was present before the flow began and lasted during the entire menstrual period. The last flow occurred two weeks before the operation. Pelvic examination showed the uterus to be retroverted, small, and freely movable; the utero-sacral ligaments were very tense and tender. The preoperative diagnosis was retroversion of the uterus and possibly implantation adenoma of the utero-sacral ligaments.

Operation was at the Albany Hospital, November 28, 1921. The uterus was

found to be retroverted and containing several small leiomyomas. The right ovary was lightly adherent to the side of the pelvis and showed a small pigmented elevation (about 1.3 mm. in diameter) on its lateral surface (Fig. 36). The left ovary seemed normal. A small elevated area about 5 mm. in diameter was present on the posterior surface of the uterus above the origin of the right utero-sacral ligament. Pigmented dots were present in this area. A similar condition was present involving both utero-sacral ligaments. Histologically the right ovary contained a typical hematoma of endometrial type about 4 mm. in diameter, which had probably perforated (Fig. 37). Typical adenomas of endometrial type were found superficially invading the posterior wall of the uterus in the area described above, and also the utero-sacral ligaments. The adenoma involving the posterior surface of the uterus and the utero-sacral ligament could have arisen from the ovarian hematoma, or both of these and the ovarian hematoma could have arisen from epi-

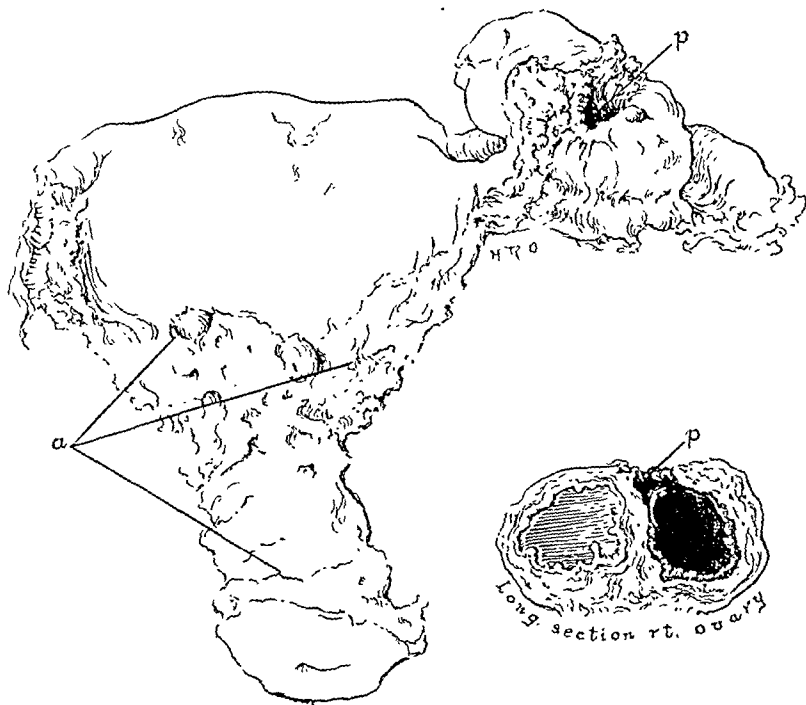


Fig. 61.—(Case 21 of the first series.) Hematoma of endometrial type of the right ovary (Fig. 63), with evidence of a previous perforation, and extensive implantation adenoma of endometrial type involving the posterior surface of the uterus (Fig. 64), and fusing it to the anterior wall of the rectum (uterus retroflexed). Posterior view of the specimen removed at operation ( $\times 3/4$ ); right ovary turned upward exposing the perforation on the under surface, ovary also shown in longitudinal section. On freeing the adherent ovary at operation, the perforation was reopened and some of the chocolate-like contents escaped. The extent of the implantations on the posterior surface of the uterus is indicated by the pointer "a" and is much greater than in the previous illustration, where the perforation was smaller. These implantations could have arisen from epithelium escaping both from the tubes and from the perforation of the ovarian hematoma. I believe that the chief source was from the perforation of the ovarian hematoma (compare with Figs. 59 and 60).

thelium escaping from or through the fimbriated end of the tube. Both tubes were apparently normal and patent. The patient made a satisfactory convalescence.

CASE 12.—*Bilateral hematosalpinx and "adenomyoma" of the distal ends of both tubes with extension through to their peritoneal surface, implantation adenoma of endometrial type on the posterior surface of the uterus, small intramural leiomyomas, of the uterus (no evidence found of hematomas of endometrial type in the ovaries).* Mrs. F. S., aged forty-one, complained of uterine bleeding. She had been married

eleven years and had never been pregnant. Menstruation had been regular and normal until a year ago; since that time it had become more frequent, of longer duration and at times was painful. The last flow occurred three weeks before the operation. For the last six months there had been at times bleeding independent of menstruation. Pelvic examination showed a slightly enlarged uterus with apparent inflammatory masses on both sides. The preoperative diagnosis was a possible intramural or submucous myoma with bilateral hydrosalpinx or adherent tubes and ovaries.

Operation at the Albany Hospital, December 5, 1921. The appendix, both tubes and ovaries and the entire uterus were removed. The ovaries appeared normal, and histologically no trace of adenoma of endometrial type was found in them. The tubes were distended with a thick "chocolate" fluid. The fimbriated ends were occluded, bulbous in appearance, and felt hard (Fig. 5). A diagnosis of

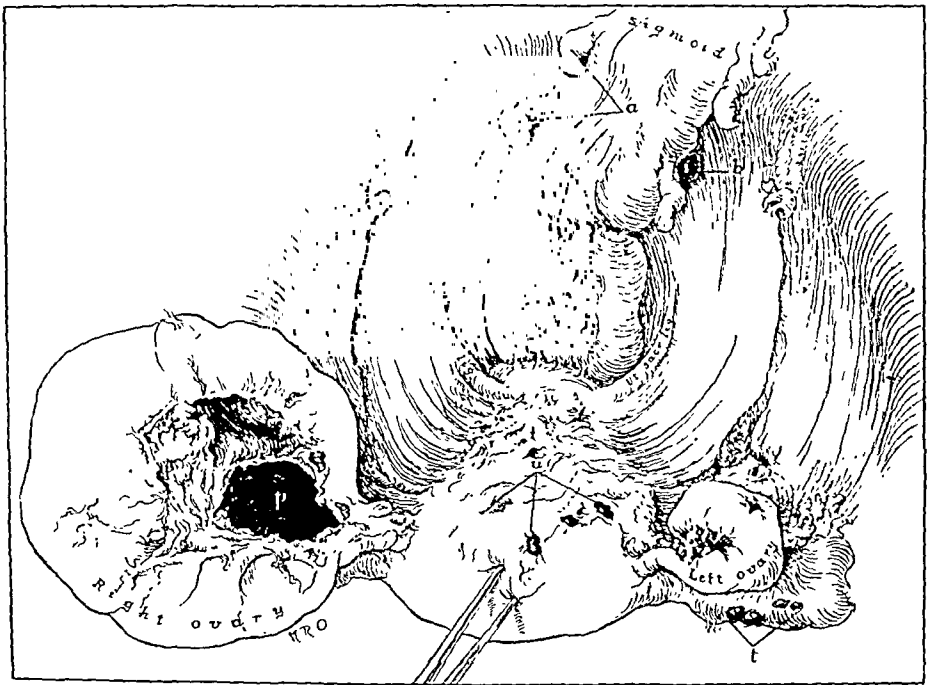


Fig. 62.—(Case 4 of second series\*). Large hematoma of the right ovary of endometrial type (Fig. 43), with evidence of a previous perforation (*p*) and extensive implantation adenoma involving the sigmoid (*c*), its mesentery (*b*) and epiploic appendages (*a*), the posterior surface of the uterus (*u*), and the left tube (*f*). The condition found at operation is indicated; after freeing the ovarian hematoma, ligating and cutting the ovarian vessels and drawing the uterus upwards and forwards. The distribution of the implantations is similar to that of an ovarian carcinoma with perforation, and I believe that the greater portion or all of the implantations in this case arose from epithelium escaping from the perforation of the ovarian hematoma, just as implantation carcinoma arises from epithelium escaping from the perforation of the primary malignant ovarian cyst. The larger the ovarian hematoma and the larger the perforation, usually the greater the extent of the implantation adenoma associated with it. It is for these reasons that I believe that the ovarian hematoma of endometrial type may be a hot bed, incubator or intermediary host in the origin of implantation adenoma. (Compare with Figs. 59, 60 and 61.)

"adenomyoma" of the distal ends of both tubes was made before they were examined under the microscope. Histologically the distal ends of the tubes resembled a section of an adenomyoma of the tube. Some of the dilated spaces were identical in structure with some of the hematomas of endometrial type found in ovaries. Stromal hemorrhage was present, with loss of the overlying epithelium, and endothelial leucocytes were also present. The histological picture indicated

that a structure similar to an adenomyoma had developed in the distal ends of both tubes, which had reacted to menstruation, causing miniature endometrial hematomas; and some of the blood escaped into the lumen of the tubes, giving rise to a hematosalpinx. The glandular elements extended through to the peritoneal surface of the tubes, and therefore menstrual blood could have escaped into the peritoneal cavity. The blood escaping from the tube might carry with it epithelial cells set free by the underlying stromal hemorrhage rupturing into the lumen of the tube. These epithelial cells might cause implantation adenoma. Such an implantation adenoma, which was similar histologically to the adenoma of the tube, was present on the posterior surface of the uterus where material escaping from the tube would be apt to fall (Figs. 11 and 12). I believe that the adenoma on the posterior surface of the uterus arose from this source. The patient made a satisfactory convalescence.

CASE 13.—*Implantation adenoma (of endometrial type) in the culdesac, adherent right ovary, retroflexion of the uterus.* Mrs. A. McE., aged 30, complained of



Fig. 63.—(Case 21 of first series<sup>1</sup>). Photomicrograph (obj. 16 mm.) of a section of the wall of the ovarian hematoma near the site of the perforation (Fig. 61). Here the hematoma is lined by columnar cells (ciliated), and gland-like structures are present in the underlying stroma. Histologically it suggests uterine mucosa. The epithelial lining was present only about the site of the perforation and in pockets of the wall of the hematoma, where it had not been completely cast off by hemorrhage (menstruation). The greater portion of the hematoma was lined by a pigmented wall consisting, for the most part, of endothelial leucocytes in various stages of retrogression similar to that shown in Figs. 48 and 49.

sterility and indefinite pains in the lower abdomen. She had been married for eight years, and had never been pregnant. Menstruation was regular, moderate in amount and free from pain. The last menstrual flow occurred two weeks before the operation. Pelvic examination showed the uterus to be retroflexed, possibly adherent. A definite nodule could be palpated in the culdesac to the right of the median line. The preoperative diagnosis was retroflexion of the uterus, and possibly implantation adenoma in the culdesac.

Operation at the Albany Hospital December 17, 1921. The uterus was found to be freely movable; the lateral surface of the right ovary was lightly adherent to the lower part of the posterior layer of the broad ligament. The ovary was freed and carefully examined for any evidence of hematomas, and none was found. Both tubes appeared patent and normal; the left ovary seemed normal. A small nodule about 6 mm. in diameter with puckering of the peritoneum over it, was



found imbedded in the tissues of the culdesac just mesial to the uterine origin of the right utero-sacral ligament. This was excised, the appendix was removed and the uterus was suspended (modified Gilliam operation). Histologically the nodule removed from the culdesac proved to be an adenoma of endometrial type (Figs. 4 and 13). This adenoma may have arisen from the implantation of epithelial cells from the right tube, or from the perforation of a small hematoma of the right ovary (the latter was slightly adherent) which had subsequently disappeared. I believe more likely the former. The patient made a satisfactory convalescence.

CASE 14.—*Pregnancy (early), multiple leiomyomas of the uterus, perforated hematoma (of endometrial type) of the left ovary, implantation adenoma (of endometrial type) of the posterior surface of the uterus; typical decidual reaction of the lining of the ovarian hematoma and of the implantations on the posterior surface of the uterus.* Mrs. A. H. B., aged thirty-seven, complained of indigestion and profuse, painful menstruation. She had been married eleven years and had never been pregnant. Menstruation had always been profuse, but much more so the last three years. At times it had been painful; pain had been more severe and more frequent the last year. The last menstrual period occurred two weeks

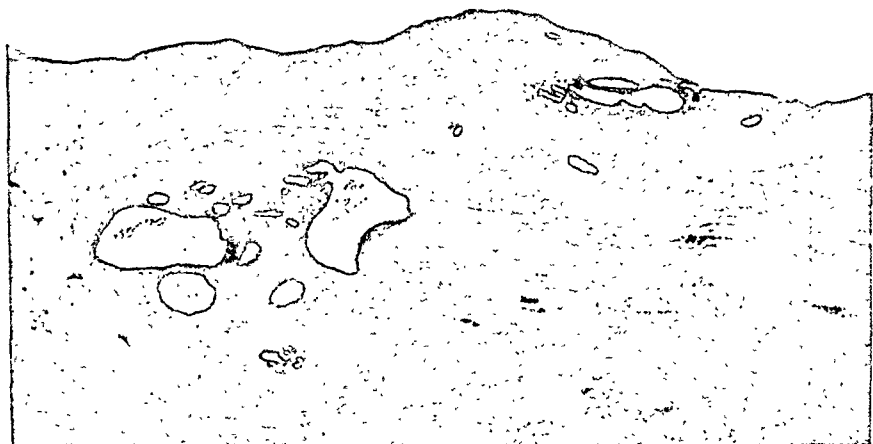


Fig. 64.—(Case 21 of first series<sup>1</sup>). Retouched enlargement ( $\times 15$ ) of a section of the posterior uterine wall shown in Fig. 61. Adenoma of endometrial type is present on the surface of the uterus, invading the wall and giving rise to an "adenomyoma." Some of the epithelium lining the gland-like spaces is ciliated, and is similar to that lining the ovarian hematoma (Fig. 63). It is an "adenomyoma" arising from epithelium implanted on the posterior surface of the uterus, probably escaping from the perforation of the ovarian hematoma. In my experience the most frequent origin of "adenomyoma" of the uterus is from epithelium implanted on its peritoneal surface, and this epithelium is derived either from the perforation of an ovarian hematoma, which acts as an intermediary host (but not as an essential one), or through the tubes.

before the operation. Pelvic examination showed that the cervix was pushed forward by a hard tumor filling the culdesac. The uterus was irregularly enlarged. The preoperative diagnosis was multiple leiomyomas of the uterus. At the operation at the Albany Hospital, December 29, 1921, the uterus was found to contain multiple leiomyomas; the largest, being about 10 cm. in diameter, was wedged in the culdesac. The left ovary was slightly enlarged and firmly adherent to the posterior surface of the broad ligament. On freeing it a small amount of chocolate-like fluid escaped. The appendix, both tubes and ovaries, and the entire uterus were removed (Fig. 67). On incising the uterus an early pregnancy was found, the fetus being 14 mm. in length (Fig. 68). The corpus luteum of pregnancy was present in the right ovary. The hematoma of the left ovary was about 2 cm. in diameter, and the perforation had occurred in its under surface. The wall of the hematoma

contained a wavy, almost polypoid lining, which histologically resembled in its decidual reaction the compact layer of the decidua vera of the pregnant uterus (Figs. 69 and 70). The epithelium for the most part was lacking, but was present in the depressions between the polypoid elevations (Fig. 69). Small bleb-like elevations were present over an area about 1x2 cm. on the posterior surface of the uterus, adjacent to the portion of the broad ligament to which the ovarian hematoma was adherent. These elevations varied in size from 1 to 3 mm. and were not pigmented like the usual implantations of endometrial type. Histologically they showed a typical decidual reaction, the larger ones with a compact and spongy layer resembling that of the decidua vera of the uterus (Figs. 71 and 72). In this specimen there were three cavities lined by tissue with the typical decidual reaction of pregnancy, the uterine cavity, the hematoma of the ovary and the implantations on the posterior surface of the uterus. I believe all three cavities were lined by similar tissue.



Fig. 65.—(Case 4 of second series<sup>2</sup>). Photomicrograph (obj. 50 mm.) of a section of the implantation adenoma of endometrial type of the left fallopian tube shown in Fig. 62. It resembles uterine mucosa, and probably arose from epithelium escaping from the perforation of the ovarian hematoma shown in Fig. 62.

*CASE 15.—Implantation adenoma of endometrial type on the mesial surface of the right ovary and on the anterior surface of the uterus just below the attachment of the right round ligament.* Miss A. W., aged thirty-six, complained of prolonged and profuse menstruation. This had been of a year's duration. A tumor in the lower abdomen had also been noticed for nearly a year. The last menstrual period occurred three weeks before the operation. Pelvic examination showed a uterine tumor extending upward into the abdominal cavity to the level of the umbilicus. The preoperative diagnosis was leiomyoma of the uterus.

Operation was at the Albany Hospital January 6, 1922. The uterus was enlarged as described above, due to one large leiomyoma (21 cm. in its greatest diameter) and several small ones; the appendix, entire uterus and right tube and ovary were removed. The left tube and ovary appeared normal. An implantation adenoma of endometrial type was present on the anterior surface of the uterus below and mesial to the attachment of the right round ligament (Fig. 9.) A similar adenoma was present on the mesial surface of the right ovary, near the utero-

ovarian ligament. It is unusual to find these ovarian implantations on the mesial surface. The tube in this instance was short, and as the pelvis was filled by the enlarged uterus, epithelium escaping from the tube would be more apt to lodge on the mesial rather than the lateral surface of the ovary. I believe that the implantations on the ovary and on the anterior surface of the uterus probably arose from epithelium escaping from the tube. Had the patient not been operated upon, an ovarian hematoma of endometrial type might have developed, the perforation of which might have given rise to further implantations. The patient made a satisfactory convalescence.

CASE 16.—*Implantation adenoma (of endometrial type) on the lateral surface of the right ovary, the lateral (anterior) surface of the right tube near the fimbriated extremity and on the posterior surface of the uterus; intramural leiomyoma of the uterus.* Mrs. L. H., aged thirty-seven, complained of prolonged and profuse



Fig. 66.—(Case 4 of second series<sup>2</sup>). Photomicrograph (obj. 16 mm.) of a section of an epiploic appendage shown in Fig. 62. It demonstrates the invasion of the epiploic appendage by the adenoma of endometrial type, and the great reaction (thickening) of the tissue about the adenomatous tubules. The epithelium lining these tubules was similar to that lining the ovarian hematoma (Fig. 43). Cilia were not found on the epithelium lining the ovarian hematoma, or the implantations.

menstruation. She had been married for five years and had never been pregnant. Menstruation had been regular, moderate in amount, of short duration (2 to 3 days), and free from pain until a year ago. During the last year it had increased in amount and in duration, the more recent menstrual periods lasting from one to two weeks, but being painless. Pelvic examination showed the uterus to be symmetrically enlarged, the fundus extending to the level of the umbilicus. The preoperative diagnosis was leiomyoma of the uterus. At the operation at the Albany Hospital, January 17, 1922, the uterus was found to be symmetrically enlarged and freely movable, except for a small area on the posterior surface (Fig. 7) which was adherent to the sigmoid. This area showed typical adenoma of endometrial type invading the uterine wall. Similar adenoma was also present on the lateral surface of the right ovary, superficially invading it (Fig. 16), and also on the lateral surface of the right tube. The left ovary was normal and both

tubes appeared patent. Both tubes and ovaries, the entire uterus and appendix were removed. Histologically the adenoma invading the posterior wall of the uterus, the right ovary and the lateral wall of the right tube, were similar. The adenomas in this specimen suggested that they had a common origin, namely, from epithelium escaping from the tube. Had the operation not been done a hematoma of the ovary would probably have developed, the perforation of which might have given rise to further implantations. The patient made a satisfactory convalescence.

CASE 17.—*Dilated gland (of endometrial type) with hemorrhage about it on the free surface of the right ovary, implantation adenoma of endometrial type on the surface of the left utero-sacral ligament and the posterior surface of the uterus, which was in contact with the implantation on the utero-sacral ligament (uterus*

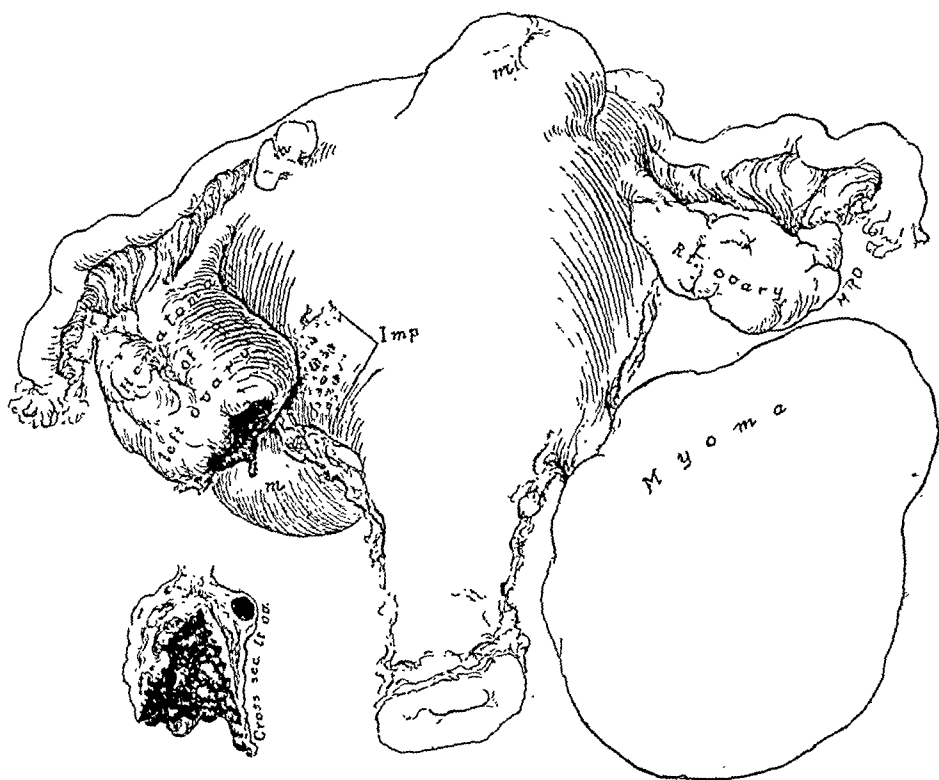


Fig. 67.—(Case 14). Hematoma of endometrial type of the left ovary, with perforation; implantation adenoma (imp.) on the posterior surface of the uterus near the site of the perforation of the ovarian hematoma, multiple leiomyomas, early uterine pregnancy with typical decidual reaction of the lining of the ovarian hematoma, and the implantation adenoma of the posterior uterine wall. Posterior view of the specimen removed at operation ( $\times 3/5$ ).

in retroflexion), multiple leiomyomas. Miss M. S., aged thirty-one, complained of severe dysmenorrhoea. Menstruation had always been associated with pain but this had increased in severity the last year. The patient was constipated, but the constipation was not more marked during the menstrual flow. The last flow occurred a week before the operation. Pelvic examination showed a retroflexed uterus which was irregularly enlarged. There was marked tenderness in the culdesac, especially on palpating the utero-sacral ligaments. The preoperative diagnosis was a retroflexed uterus with multiple small leiomyomas, and possibly implantation adenoma in the culdesac. Operation was at the Albany Hospital January 19, 1922. The uterus was retroflexed and contained multiple small leiomyomas. The largest was about 3.5 cm. in its greatest diameter. The appendix, left tube and ovary, and

the entire uterus were removed. A small pigmented elevation about 2 mm. in diameter was noticed on the free border of the right ovary. This was excised with a small amount of ovarian tissue about it. It proved to be a dilated gland of endometrial type with hemorrhage in the stroma about it (Fig. 21). A small corpus luteum hematoma was present in the left ovary, which at the operation was mistaken for an endometrial hematoma. Both tubes were apparently normal and

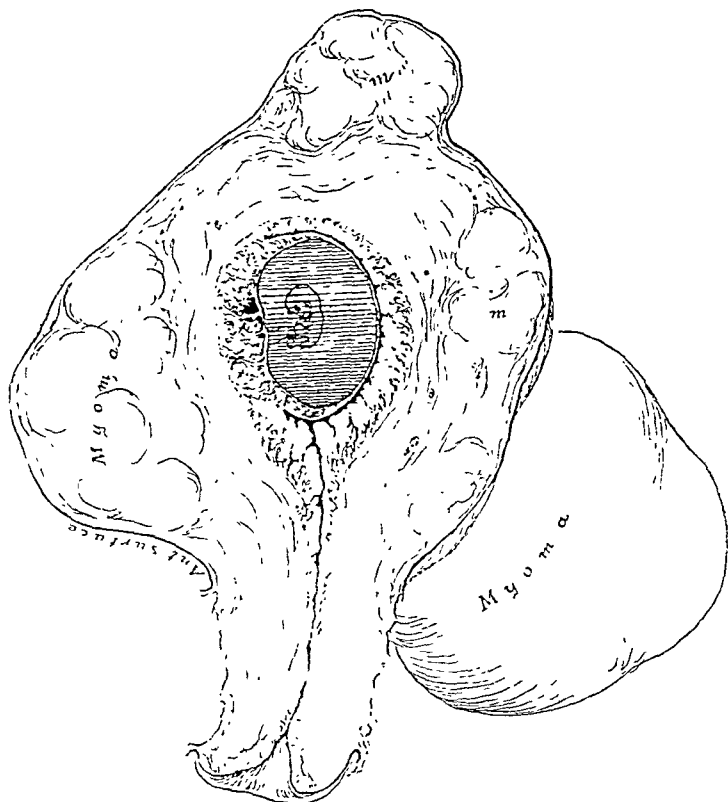


Fig. 68.—(Case 14). Sagittal section of the uterus shown in the preceding illustration, demonstrating the early pregnancy (embryo 14 mm. long) ( $\times 3/5$ ).



Fig. 69.—(Case 14). Photomicrograph (obj. 16 mm.) of a section of the wall of the ovarian hematoma, showing the wavy, almost polypoid surface, with epithelium only in the depressions. The stroma was very vascular, and showed as typical a decidual reaction as the compact layer of the decidua vera of the pregnant uterus. The surface epithelium, present in the depressions, was also similar to the surface epithelium of the compact layer of the decidua vera.

patent. Implantation adenoma of endometrial type was present on the surface of the left utero-sacral ligament and of the posterior wall of the uterus, which were in contact with each other, the uterus being retroflexed (Figs. 6 and 14). What is the relation between the adenoma of endometrial type on the free surface of the right ovary and those on the surface of the left utero-sacral ligament and the posterior surface of the uterus? They all could have had a common origin from

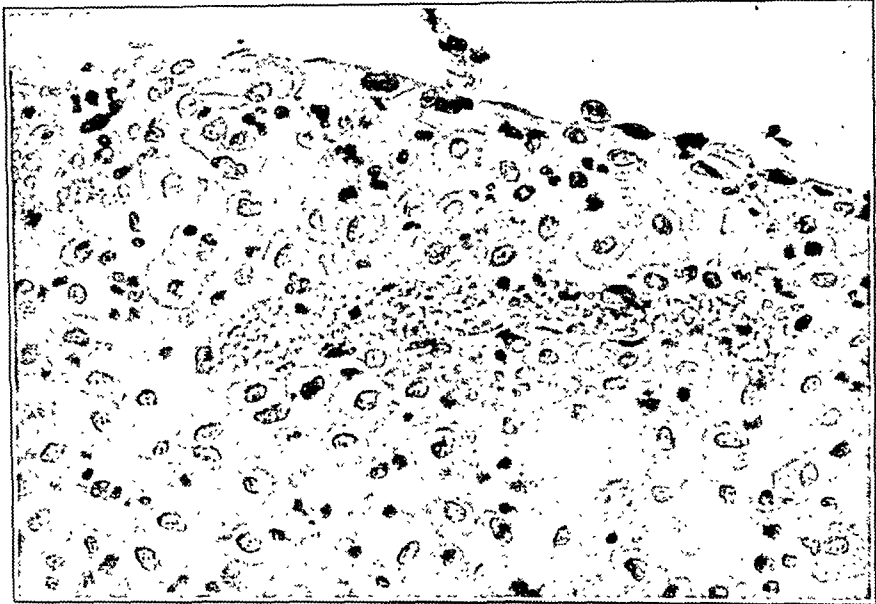


Fig. 70.—(Case 14). Retouched photomicrograph (obj. 4 mm.) of a portion of the stroma shown in the preceding section. Histologically the cells are typical decidual cells.

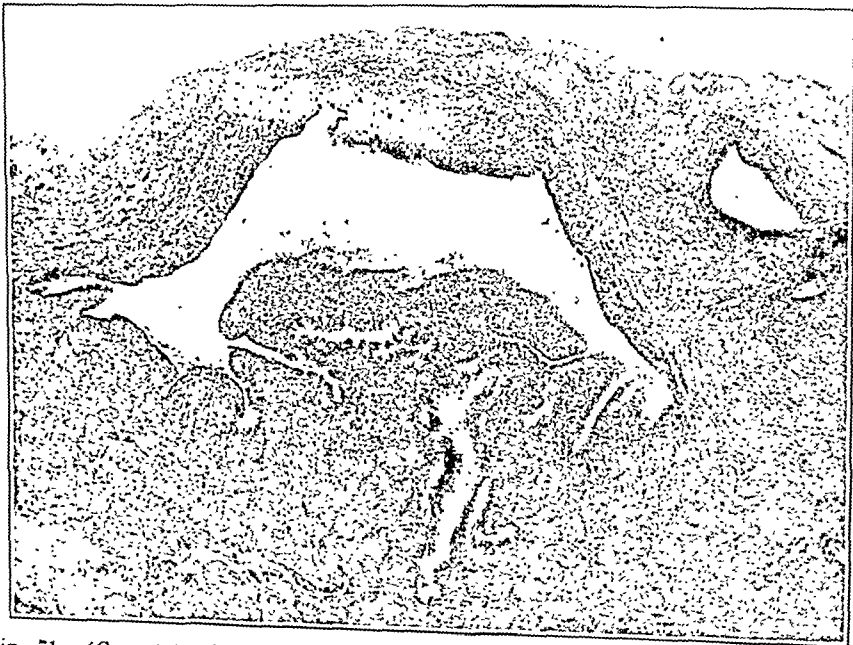


Fig. 71.—(Case 14). Photomicrograph (obj. 50 mm.) of a section through a portion of the implantation adenoma, involving the posterior surface of the uterus (Fig. 67). The larger of a portion of its lining forming a compact and spongy layer, with a typical decidual reaction decidua vera of the pregnant uterus.

epithelium escaping from the tube and becoming implanted on the surface of the ovary and the pelvic structures. The adenoma on the surface of the right ovary might represent the remains of a small ovarian hematoma in which perforation, with the loss of the greater portion of the epithelial lining, had been followed by repair. The patient made a satisfactory surgical convalescence.

CASE 18.—*Implantation adenoma (of endometrial type) of the posterior uterine wall, culdesac, and posterior surface of the right broad ligament; retroflexion of the uterus.* Mrs. H. D., aged twenty-two, complained of severe dysmenorrhea. She had been married for sixteen months and had not become pregnant. She was very anxious to have children. Menstruation had been regular, moderate in amount and

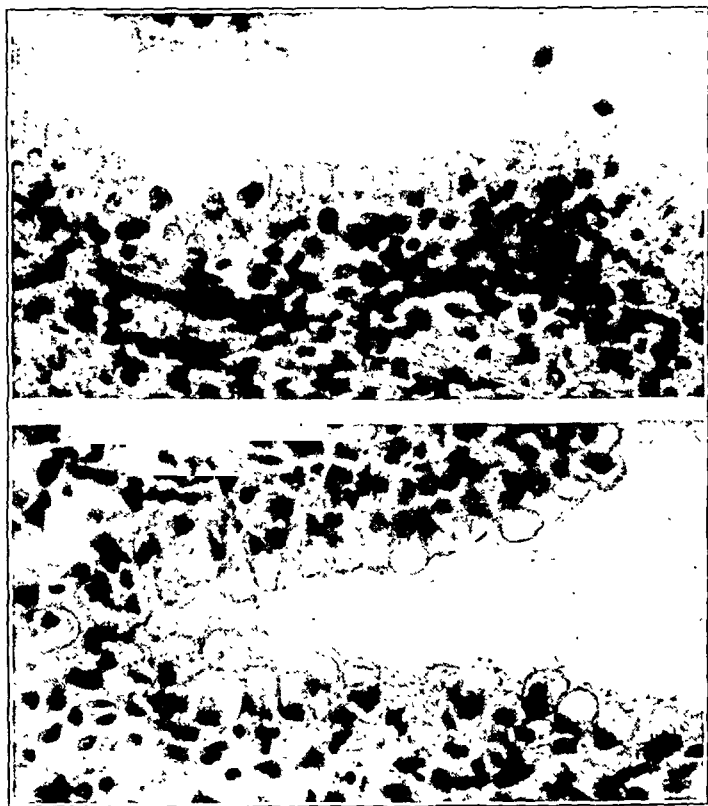


Fig. 72.—(Case 14). Two photomicrographs (obj. 4 mm.) showing the character of the epithelium lining the glands in the spongy layer of the implantation adenoma of the posterior uterine wall, shown in Fig. 71, and that lining the glands of the spongy layer of the decidua vera of the pregnant uterus. Histologically they are identical. The typical decidual reaction of pregnancy was present in the lining of three separate cavities of this specimen: the uterine proper, that of the ovarian hematoma, and that of the implantation adenoma of the posterior uterine wall. The uterine cavity proper was lined by endometrium. By what term should the lining of the other two be designated? Sections taken from three different portions of both fallopian tubes failed to show any decidual reaction.

had been associated with pain ever since puberty. For the last two years the pain had been increasing in severity, and lasted for the entire duration of the flow. The last flow ceased the day before the operation. Pelvic examination showed that the uterus was retroflexed but freely movable. The preoperative diagnosis was retroflexion of the uterus. Operation at the Albany Hospital March 18, 1922. The appendix was first removed. The uterus was found to be retroflexed and after replacing it a pigmented (hemorrhagic) elevation about 2 mm. in diameter was noticed on the posterior surface of the right uterine cornu, and a similar but

broader elevation (implantation) was detected in the culdesac (Fig. 3), at a place which exactly came in contact with the implantation on the uterus when the latter was replaced in retroflexion. A similar implantation (but not as hemorrhagic) was found on the posterior surface of the right broad ligament. Both tubes and ovaries appeared normal, and the latter were examined very carefully for implantations. The implantations described above were excised, the uterus was suspended and the cervix dilated.

Histologically the three implantations were all adenomas of endometrial type. All had apparently reacted to menstruation, the one on the uterus and the one in the culdesac to the last menstrual period, and the one on the posterior surface of the broad ligament to a previous period (Figs. 17, 18, 19 and 24). These implantations were in situations which at times could have been in contact with the fim-

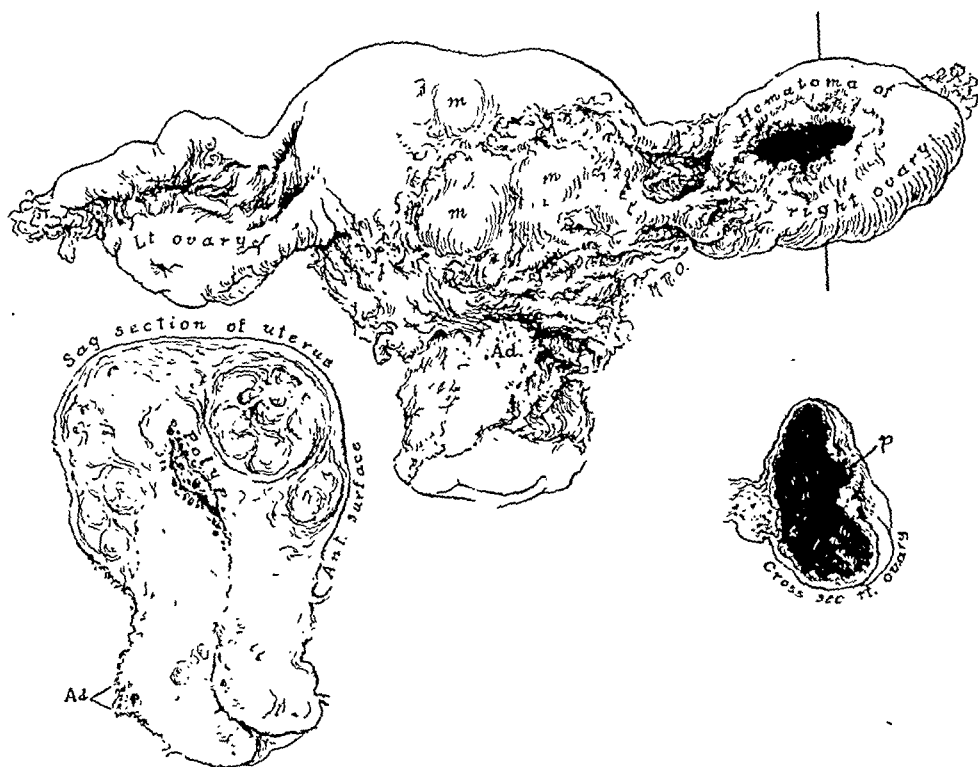


Fig. 73.—(Case 6). Remains of a hematoma of endometrial type (with evidence of a previous perforation) of the right ovary in a patient 61 years old; implantation adenoma involving the posterior uterine wall, multiple leiomyomas, uterine polyp, uterus retroflexed and fused to the bottom of the culdesac. Posterior view of the specimen removed at operation, right ovary turned upwards exposing its lateral surface with the perforation; ovary also shown in cross section and uterus in sagittal section ( $\times 2/3$ ). See Figs. 74 and 75 for photomicrographs of the wall of the ovarian hematoma and the posterior wall of the cervix at Ad.

briated end of the right fallopian tube, and I believe arose from epithelium escaping from the tube. The implantation on the surface of the uterus might have been a contact implantation from the one in the culdesac, or vice versa. The patient made a satisfactory convalescence.

CASE 19.—*Implantation adenoma (of endometrial type) of the mesial surface of the right ovary, the right broad ligament between the tube and the ovary and on the suspensory ligament of the ovary; retroflexion of the uterus.* Mrs. J. McG., aged thirty-two, complained of backache and repeated abortions. She had had three abortions in four years, all occurring at the second to the third month of pregnancy, the last one took place six months ago. Menstruation had been regular,



moderate in amount, and always associated with pain, which had increased slightly in severity. The last flow occurred three weeks before the operation. Pelvic examination showed that the uterus was retroflexed; the appendages on the right side were adherent and very tender on palpation. The preoperative diagnosis was retroflexion of the uterus with pelvic adhesions. Operation was at the Albany Hospital April 6, 1922. The appendix was removed. On exposing the

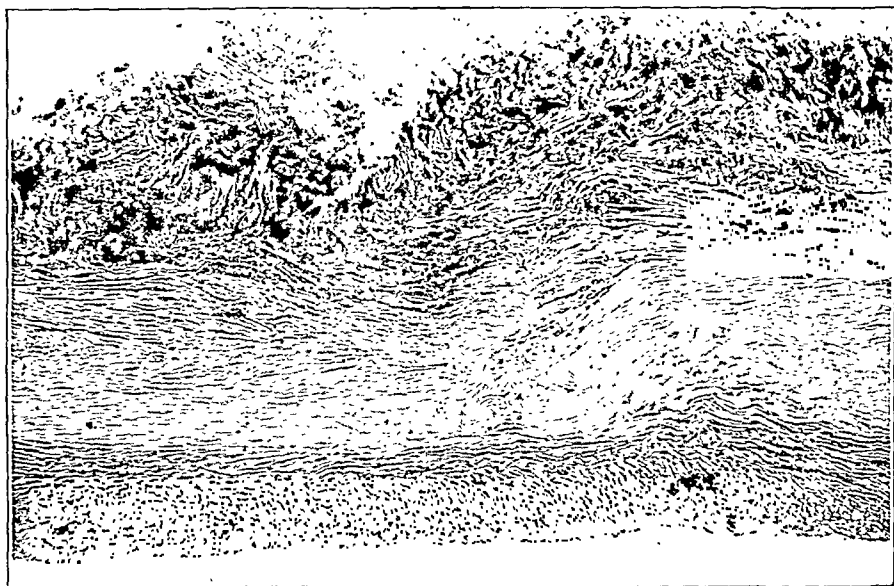


Fig. 74.—(Case 6). Photomicrograph (obj. 16 mm.) of a section of the wall of the ovarian hematoma. The epithelial lining had entirely disappeared. The wall of the hematoma consists of hyaline connective tissue, infiltrated with blood pigment. This represents a later stage of the portion of the wall of the hematoma shown in Fig. 48. As the reaction to menstruation in these hematomas is destructive, and the repair is slow, hindered by the retention of the menstrual blood in the cavity of the hematoma and the attempt to absorb the blood in its walls, the ultimate tendency of the hematoma is one of retrogression.

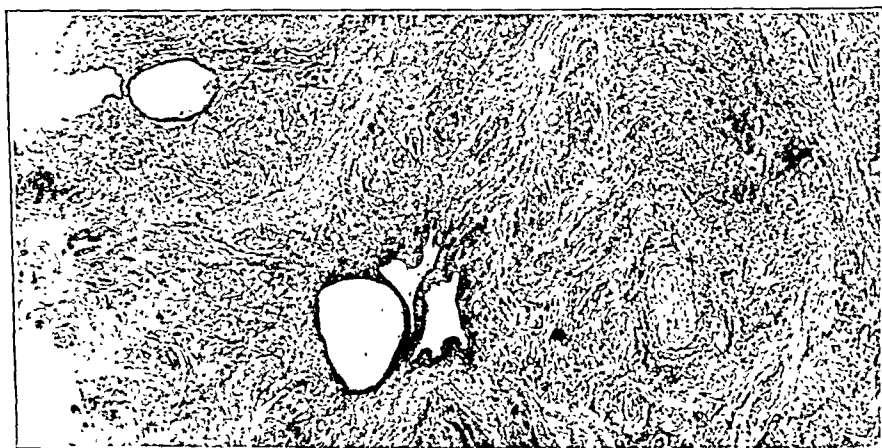


Fig. 75.—(Case 6). Photomicrograph (obj. 16 mm.) of a section of the posterior wall of the supravaginal portion of the cervix indicated by *Ad.* of the sagittal section of the uterus shown in Fig. 73. The adenoma had apparently invaded the cervical wall from its peritoneal surface (to the left), the glandular elements of the adenoma were similar to those of the mucosa of the uterus. The reaction of the lining of the ovarian hematomas of endometrial type and that of the implantation adenomas, to menstruation (except as altered by the attempt to absorb the retained menstrual blood), to pregnancy, and to old age, is similar to that of the endometrium.

contents of the pelvis the uterus was found to be retroflexed, and the right tube was kinked, and adherent to the upper and mesial surface of the ovary in such a manner that the patent fimbriated end rested on the anterior surface of the suspensory ligament of the ovary. Small pigmented elevations of implantation adenoma were present on the surface of the suspensory ligament, directly in front of the fimbriated end of the fallopian tube (Fig. 8). Similar implantations were also present on the mesial surface of the ovary, and on the broad ligament between the ovary and the tube. The left ovary and tube appeared normal. The right tube and ovary, including the portion of the suspensory ligament with the implantations, were removed and the uterus was suspended by suturing the round ligaments to its posterior surface.

Histologically the implantations were of endometrial type. All had apparently reacted to menstruation. The situation of the implantations, especially the one directly in front of the fimbriated end of the tube, on the suspensory ligament of the ovary, would indicate that they arose from epithelium escaping from or through the fimbriated end of the tube. The patient made a satisfactory convalescence.

CASE 20.—*Implantation adenoma (of endometrial type) on the lateral surface of the left ovary and in the culdesac; multiple leiomyomas of the uterus.* Mrs. G. G., aged forty-two, complained of frequency of urination. She had one child eighteen years old, the only pregnancy. Menstruation was regular, moderate in amount, and free from pain until the last menstrual period, which was painful. The patient was operated upon the day before she expected to menstruate. Pelvic examination showed an irregular hard tumor filling the pelvis, and extending upward into the abdomen nearly to the level of the umbilicus. The preoperative diagnosis was multiple leiomyomas of the uterus. Operation was at the Albany Hospital April 15, 1922. The appendix, the left tube and ovary, and the entire uterus were removed. The right tube and ovary appeared normal. A small area with raised pigmented dots was found on the posterior surface of the lower portion of the right broad ligament, near the uterine origin of the utero-sacral ligament; this was excised. The small elevations about 1 and 2 mm. in diameter were present on the lateral surface of the left ovary (Fig. 22). These were bright red in color, apparently due to a recent hemorrhage (the patient expected to menstruate the following day). Histologically these elevations were due to hemorrhage about a gland of endometrial type (Fig. 23). The patient made a satisfactory convalescence.

#### CONCLUSIONS

Next to leiomyoma of the uterus, the pathologic conditions arising from the implantation of epithelium which escapes from the fallopian tubes into the peritoneal cavity probably furnish the most frequent pelvic lesions found in women between the ages of thirty and the menopause. During the last year thirty-seven cases with these lesions were found by me in 170 abdominal operations for pelvic conditions in women between thirty and fifty years of age. Should the epithelium escaping from the tube fall on suitable "soil" it develops into glands or tubules of endometrial (müllerian) type which generally react to menstruation. These adenomas are usually

found on the structures which are most frequently in close contact with the fimbriated end of the tubes, such as the lateral and under surfaces of the ovaries and the peritoneal surface of the structures in the culdesac (see text). Implantation adenoma may occur only on the surface of the ovary or ovaries, or both in the ovaries and on the pelvic peritoneum, or on the pelvic peritoneum alone.

The primary peritoneal implantations are usually small and insignificant, but may spread and become invasive.

The implantations on the ovary invade the tissues of that organ, and, as a result of their reaction to menstruation, develop into superficial or deep hematomas (hemorrhagic or menstruating cysts) of endometrial (müllerian) type. The casting off of all of their epithelial lining by menstruation may cause the death of the hemorrhagic cyst before perforation occurs; but most of them rupture, or perforate into the peritoneal cavity. Perforation occurs in the superficial ovarian hematomas while they are still small, a few millimeters in diameter, and as the result of menstruation and perforation the entire epithelial lining may be cast off and the hemorrhagic cyst may disappear.

The hematomas developing in the deeper tissues of the ovary may attain a large size, several centimeters in diameter, before perforation occurs. As the menstrual blood is retained in the cavity of the hemorrhagic cyst and in the stroma of its lining for a long time, many interesting histologic changes occur in the wall of the cyst in the attempt to absorb the menstrual blood, and to reline the denuded surface by epithelium from that which had not been removed by menstruation. The development and activities of the endothelial leucocytes, which act as scavengers, play an important part in the absorption of the menstrual blood and the deposit of the pigment, derived from this blood, in the walls of the hematoma. Perforation permits the contents of the hematomas to escape into the peritoneal cavity, and may temporarily relieve the embarrassment caused by its retention. The perforation is sealed by the ovary or cyst becoming adherent to adjacent structures at the site of its perforation. The hematoma again fills up with blood at its next reaction to menstruation, and repeated perforations may occur. As the reaction to menstruation is destructive, and as the repair and regeneration of the epithelial lining is accomplished under great difficulties (due to the retention of the menstrual blood), the ultimate tendency of the hemorrhagic cyst is one of retrogression.

In its reaction to menstruation, portions of the epithelial lining are cast off into the cavity of the hematoma, and may be found lying free in its hemorrhagic contents. Adenomas of endometrial type may

be found on the surface of the ovary about the perforation, and in the tissue of the structures adherent and adjacent to it, as well as in situations where the material escaping through the perforation would be apt to lodge. This indicates that these adenomas may be derived from the implantation of epithelium cast off by menstruation into the cavity of the hematoma, and escaping through the perforation. Implantations may arise from small as well as from large ovarian hematomas; generally the larger the hematoma and apparently the larger the perforation, the greater the distribution of the implantations from this source. These secondary implantations often resemble normal endometrium more closely than the epithelial lining of the original ovarian hematoma, and are often more invasive, and more closely resemble normal endometrium than the implantations found in the pelvis without evidence of an ovarian hematoma with perforation, i.e., those resulting from a primary implantation from or through the tube. For these reasons I consider the ovary as an incubator, hot bed, or intermediary host in the development of pelvic implantation adenomas of endometrial type, which in some instances may possibly impart greater virulence to the epithelium developing in it; but it is not an essential intermediary host in the origin of all implantation adenomas of endometrial (müllerian) type.

May the primary ovarian and peritoneal implantations (those developing from epithelium escaping from the fallopian tube) arise from both tubal and uterine epithelium? The specimens which I have studied would suggest that they may. We may histologically divide these implantations into three groups. First, those consisting of glands, or tubules and dilated tubules, often lined by ciliated epithelium and without the characteristic stroma of normal endometrium, or with the stroma poorly developed. The structure resembles that of the mucosa of a primary adenomyoma of the tube, and strongly suggests that the implantations might have been derived from the epithelium of the fallopian tube. In the second group the adenomas consist of stroma and glands, similar to those of normal endometrium. The histological picture strongly suggests that these adenomas were derived from uterine epithelium escaping through the lumen of the fallopian tube, namely, from menstruation with a back flow into the peritoneal cavity, or from portions of tubal mucosa which had reacted to menstruation. In the third group the picture suggests a mixture of adenomas of tubal and uterine type, or represents transitional stages from one to the other.

The epithelial lining of the ovarian hematomas or hemorrhagic cysts may also suggest either a tubal or a uterine origin.

In cases with implantation adenomas in the pelvis which are associated with an ovarian hematoma showing evidence of perforation,

both primary implantations from or through the fallopian tubes and secondary implantations from the ovarian hematoma may be present; but the latter probably usually predominates.

It is difficult to determine the factors which favor the implantation and growth of tubal and uterine epithelium on the surface of the ovary, and on the peritoneum. As implantations result from the perforation of the ovarian hematoma, which contains menstrual blood, this may be an important agent in facilitating the development of these implantations. This suggests that menstruation with a back flow through the tubes into the peritoneal cavity may be an important contributory factor. These implantations are frequently found in patients with retroflexion of the uterus, leiomyomas and uterine polyps; conditions which with patent tubes might favor a retrograde menstruation.

The reactions of the lining of ovarian hematomas of endometrial type to menstruation, pregnancy (one case) and old age (two cases) were similar to those of the uterine mucosa.

I believe that the implantation adenomas in the ovary derived from tubal and uterine epithelium are the source of many ovarian cysts and carcinomas, and am convinced that two of the latter, which I am studying at the present time, arose from this source.

I wish to thank those who have made this work possible: Dr. Thomas Ordway and Dr. Victor C. Jacobson, for placing at my disposal the facilities of the pathological laboratory of the Albany Hospital and the Albany Medical College; Miss Miriam Ruth Oliver for her cooperation and skill in presenting the various pathologic lesions as they really appear, and Dr. Lawrence De Noyelles for the preparation of the microscopic sections.

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(For discussion, see p. 561)

## SOME PHASES OF BOVINE GENITAL INFECTIONS OF POSSIBLE INTEREST TO THE MEDICAL PROFESSION\*

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THERE are no specific venereal infections which are known to be intertransmissible between cattle and people. It is not impossible that certain genital infections of cattle and men, not designated as specific, may be closely allied or identical.

Aside from such considerations, cattle offer in many respects unequalled opportunity for the study of the physiology and pathology of reproduction. Such a study should prove of great value in determining some of the fundamental principles of sex hygiene and disease.

The internal genital organs of adult cattle are readily and intimately palpable per rectum, surpassing in this respect those of any other animal. The ovaries are readily reached, fully exposed and clearly defined. The development and rupture of the ovisac, the concurrent uterine engorgement and the growth and atrophy of the corpus luteum can be traced as clearly as if the removed organs lay before the student upon the table. Estrum is short, sharp and clear and its relation to ovulation, fertilization and menstruation is too clear to afford room for conflict of opinion.

Genital lesions in great abundance and endless variety can be intimately studied from beginning to end. There are slaughtered annually for food many millions of cattle of all ages and both sexes. When slaughtered they are presumably in good physical health at least insofar as affecting the safety of their carcasses for human food. From these the genitalia are procurable immediately after slaughter by bleeding, without opportunity for the postmortem migration of bacteria. They furnish every imaginable variety of genital disease. The females include nonpregnant animals and those pregnant in every stage.

The sexual relations of cattle are under the arbitrary control of the breeder and offer extensive opportunity for the study at close range of the effects of polygamy, polyandria and sexual excess.

The genital infections of animals bear no burden of social stigma and their results find expression in terms of scientific interest or of

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individual or state economy. While specific venereal infections exist, those not so regarded, but rather analogous to, and not clearly separable from, wound infection are of greater scientific interest because they supply a far richer field for studying the fundamental principles involved in genital diseases. In the medical profession the social stigma of syphilis and gonorrhea has perhaps tended to cause students, reformers and the public to look upon genital diseases as the result of trespasses upon statutory, moral and ecclesiastical laws and has probably befogged to some degree the underlying scientific principles of the problem as a whole.

Recent researches have shown that bovine genital infections of the type not designated as specific venereal diseases are essentially universal, that they advance or retire in obedience to laws reasonably well known and that they may or may not cause serious harm depending upon the state of the balance between the infection and the power of resistance offered by the individual.

It is freely admitted that the copulatory organs of all species harbor an extensive bacterial flora which does not as a rule seriously imperil the sexual or general health. In cattle the infections are not at all confined to the copulatory area but generally involve the cervical canal, uterus, oviducts, ovaries, testicles, epididymes and seminal vesicles.

Infections of the cervix are commonly recognizable clinically not later than the second parturition. The cervical mucosa becomes swollen, reddened and prolapses through the os uteri externum into the vagina. Heifers in first pregnancy not rarely develop an indurative cervicitis rendering parturition difficult or impossible. The cervical mucus is often excessive and wholly abnormal. Cultures from the cervical canal generally produce growths. The uterine cavity is less frequently involved, but in a majority of cases, the non-gravid organ yields positive cultures. The gravid uterus is not far behind the non-gravid in its bacterial content.

The intrauterine infection concentrates about the os uteri internum and at the apices of the cornua in close proximity to the tubal openings. At these foci notable lesions occur. At the apices of the cornua there is generally a very limited area of endometritis with the endometrium edematous and its surface encrusted. The lesions are most extensive in the nongravid horn where the chorion is less vascular and comparatively passive. The chorion lying within this area is necrotic, dry and dark yellow or brown as shown in Fig. 1. The extent of the necrosis is variable but is virtually universal.

The lesions at the os uteri internum are less frequent but more important. There also endometritis is present, the involved area varying greatly in extent and the contiguous chorion may be necrotic

as seen in Fig. 1. Occasionally the cervical canal is devoid of a seal and there protrude into the vagina portions of the chorion which are necrotic and rapidly decomposing as indicated in Fig. 2 but further forward (toward the ovary) the chorion is not detached, and the embryo may yet live, but abortion is inevitable unless gestation is nearing its physiological close. The pathological expulsion of the bovine embryo or fetus (except for surgical or artificial abortion) is, so far as known, always due to cervical endometritis.

Apical or cornual endometritis, though frequently extensive, apparently does not tend to cause the uterus to expel its contents. Not infrequently in cows there is observed an intense diffuse endometri-



Fig. 1.—Bovine fetal sac and embryo at about 100 days. *A*, amniotic sac; *Al*, allantoic sac; *J*, necrotic tip of nongravid horn of chorion; *2*, necrotic area contiguous to the os uteri internum. (From *Diseases of the Genital Organs of Domestic Animals*, by the author.)



Fig. 2.—Impending abortion in cow pregnant 80 to 90 days. Cervix, uterus and ovaries viewed from above, the cervical canal being laid open to show portions of the chorion occupying the canal and extending into the vagina. *1*, an apparently healthy portion of chorion; *2*, *3*, necrotic chorion; *4*, lips of cervix; *O*, left ovary; *C*, large cyst representing the right ovary. (From *Diseases of the Genital Organs of Domestic Animals*, by the author.)

tis but instead of causing abortion, it paralyzes the uterus, the fetus dies and undergoes maceration or putrid decomposition.

If the cow is in twin pregnancy the endometritis advancing from the cervix logically involves the basal fetus first. If it dies it will probably not be expelled at once. The presence of the healthy apical fetus inhibits uterine contractions until such period as the infection has killed or seriously injured it, when the two are expelled in quick succession. The basal fetus is smaller than the apical one and perhaps shows maceration. Rarely the two may die in quick succession



and are expelled promptly. Still more rarely the basal fetus is expelled soon after its death and the apical fetus remains to the normal end of pregnancy and is born.

The general conception of the nature of abortion is extremely vague. Abortion is attributed to bad food, mechanical injuries, psychic disturbances, bacteria and other causes, but there is no credible explanation of how so varied a list of factors may each cause the same phenomenon. Such a view leads to confusion in diagnosis, prophylaxis and therapeutics.

My researches indicate clearly that abortion in cows is uniformly attributable to cervical endometritis, which in turn is the result of bacterial invasion. I have examined in the abattoir the uteri of several thousand pregnant cows which had been shipped long distances associated with extreme fright, rough handling and food and water starvation. A number of these showed evidences of impending abortion, always in the form of endometritis radiating from the os uteri internum. I have slaughtered some animals which have aborted following inoculation with the *Bacterium abortus*. In each case an intense cervical endometritis was present. There is no instance recorded in which a cow has been destroyed soon after aborting in which this lesion was not present and in which it did not constitute the sole credible explanation for the disaster. Some veterinarians invoke mechanical injury as a potent cause of those abortions which they cannot attribute to *Bacterium abortus* but rest their assertion upon faith without facts. I had occasion to ship 17 pregnant heifers from Boston, Mass., to Hawaii. Aside from occasionally tumbling over each other in the freight cars the long trip was without incident until transferred at Honolulu to a little interisland freighter which immediately ran into a storm of unusual violence, the vessel being tossed about mercilessly for 32 hours on a sail ordinarily completed in 14. The boat rolled and pitched, the breakers keeping the decks awash and the pregnant heifers were unmercifully thrown about. It was impossible to go among them to feed, water or give other care. They were utterly exhausted when landed but each calved at full term, in a physiological manner and their calves were unusually vigorous and healthy. They did not abort because, and only because, they did not have cervical endometritis. According to my researches no bacterium can directly cause abortion but must first produce an intense endometritis at the cervical end, establishing a peripheral irritation while the ovarian end of the uterus retains its power of effective contraction. This basic lesion having become established, the way is open for the injurious action of a variety of forces. Any psychic, mechanical, bacterial or other factor which lowers the resistance of the pregnant individual may increase the virulence of the

infection upon which the lesion depends and precipitate abortion when otherwise premature birth or birth at full term would have been probable. So among cattle there are observed at times great storms of abortion when in a group of a thousand or more pregnant females more than 90 per cent abort, the immediate cause of which appears to be a bad state of nutrition due to insufficient or unsuitable food but back of all this must be the basic bacterial lesion.

If the principles involved in abortion in cattle as revealed by researches hold true by analogy for woman they tend to clarify the conception of that phenomenon. Probably of greater practical interest this view suggests to the gynecologist that in handling cervicitis in women, the aim should be to eradicate the cervical lesions as completely as possible before fertilization is attempted, not merely to render conception more probable but also to insure the safety of the desired pregnancy.

A highly interesting observation in bovine genital infections is the prevalence of bacteria in the alimentary tract of the fetus which naturally persist at birth. These bacteria are essentially identical with those which exist in the cervix, oviducts, nongravid and gravid uterus. The evidence indicates quite clearly that the infection is swallowed. As soon as the oral end of the alimentary tract is open the embryo begins to swallow its amniotic fluid. The bovine fetus being heavily covered with hair and this being abundantly shed, the results of this swallowing process are strikingly shown in the meconium at full term as seen in Fig. 3 with its luxuriant content of hair. This filtration process usually keeps the amniotic fluid free from bacteria but it appears clear from their presence in the alimentary contents that, like the hairs, they must have been swallowed, suspended in the amniotic liquid. It is most probable that the penetration occurs through the necrotic areas of the fetal sac at the apices of the cornua and that the bacteria reach the allantoic fluid whence there remains only the very thin amniotic membrane to pass in order



Fig. 3.—Pellet of meconium from new-born calf showing abundance of swallowed hairs. (From An. Rep. N. Y. State Veterinary College at Cornell University.)

to reach the amniotic fluid as shown in Fig. 1 and are then swallowed. Once in the alimentary canal the bacteria may acquire pathogenic force, irritate the mucosa and cause fetal diarrhea, or penetrate the mucosa and reach the blood stream. More commonly they fail to acquire pathogenic force and remain inert in what may be termed a state of inclusion rather than infection.

A large proportion of aborted fetuses suffer from diarrhea prior to their death and many premature calves are born smeared over with feces. Occasionally a calf born at full term shows that it has had diarrhea as a fetus and the phenomenon may still be active at the time of birth. Some calves are born at full term suffering severely from sepsis and quickly perish.

Most calves are born apparently healthy and vigorous but many of them break down in a few hours to a few days with profuse diarrhea. The probability of the advent of diarrhea depends upon several factors. It is most probable in calves, the dams of which have severe uterine infection as indicated by slow parturition owing to uterine inertia as the result of severe intrauterine infection, and in those dams which showed marked clinical evidences of extensive endometritis and of placentitis as indicated by placental retention. The attack of diarrhea is favored by the early feeding of large quantities of milk, especially if it has been boiled. The phenomenon is best avoided by feeding the raw milk of the mother.

The diarrhea of the newborn is exceedingly interesting because in large herds of dairy cattle the calves are usually removed from their dams either immediately at birth without being allowed to suck or at some period within ten days. The calves are then assembled in large numbers in a calf barn where they are in more or less intimate contact, fed from a common stock of milk by a caretaker without knowledge of, or belief in, the importance of the transmission of bacteria from one individual to another. The entire group in a given establishment is accordingly quite uniformly exposed to any infection carried by any one calf. The result is that in many herds of large size essentially all calves born suffer in varying degrees from diarrhea or from digestive disturbances falling short of this but evidenced by pasty, ill-smelling feces which adhere to the hair and skin of the tail and buttocks. It is not rare to see a mortality of 100 per cent for several months in succession and of 30 per cent extending over a number of years. It is often complicated with pneumonia, pyemic arthritis, pyemic abscesses in the liver, spleen, spinal canal and elsewhere. It is found by experiment that the diarrhea and the associated phenomena may be largely averted by denying the calf all milk or other food for a period of 24 to 48 hours and in the meantime facilitating the emptying of the alimentary tract so that a minimum number of the bacteria included at birth shall remain to multiply in, and decompose the food given. On the same ground, when milk is given, it is in very small amount, not exceeding 2 per cent of the body weight.

Researches have also shown that diarrhea may be largely prevented, or when present, overcome by giving the so-called calf scours

serum, which consists of the blood serum of horses, after the animal has been rendered highly resistant to the introduction of large and virulent doses of the living bacteria presumed to cause the diarrhea. Each progressive step in the researches provides new interest. It is found that while as a rule the raw milk of the mother is the best natural security against diarrhea and that boiled milk tends to cause virulent diarrhea in many calves, those which are born without bacteria in the alimentary tract, or in which the bacteria are very few, as evidenced by an easy birth at full term and a rapid expulsion of the fetal membranes, the calf will grow splendidly upon boiled milk from the first. Or if the alimentary tract of the calf is badly infested with bacteria and boiled milk would probably cause fatal diarrhea, if the horse serum is given liberally the boiled milk may be fed with good results. A further step in the researches shows that when diarrhea is present, it may often be controlled by the hypodermic or intravenous introduction of the blood serum, or the noncoagulated blood or by the transfusion of the blood of the dam.

These data lead to the conclusion that the diarrhea of newborn calves is fundamentally due to bacteria included within the alimentary tract at birth. During pregnancy, the same bacteria may cause fetal diarrhea or sepsis and play an essential rôle in the morbid illness precedent to abortion. In large herds it cannot well be that all calves carry, into postnatal from prenatal life, bacteria which will inevitably cause diarrhea. Observation makes it clear that the disease may have either pre- or postnatal origin.

There has been much discussion in the medical profession regarding the dangers of cow's milk as a food for infants. It has been regarded as definitely inferior for the infant to that of its mother, and the question of whether it should be fed raw, pasteurized or boiled has caused controversy.

The researches upon calves seem to shed much light upon this question. The evidence obtained indicates that while the alimentary tract of the calf commonly carries from the uterus of its dam bacteria in a state of inclusion which possess high pathogenic powers, the fetal blood possesses no adequate protective substances against these bacteria because the placental filter has barred their entrance from the maternal blood. The milk of the mother carries protective substances in a degree which largely meets the demand of the newborn and when the milk is taken as food, the protective substances contained tend to prevent the bacteria in the stomach and intestines from acquiring pathogenic force. But if the milk is boiled the protective substances are destroyed and diarrhea tends to follow. If, however, the calf carries no bacteria in its digestive tract when born, or if such antibodies are experimentally supplied from other sources, boiled milk can be fed with excellent results.

It is to be remembered that the milk of a cow may, and often does, contain the same bacteria as her uterus and hence the same as those in the intestinal tract of the calf. The location of the mammary glands of the cow render it almost unavoidable that portions of any discharges from the genital tract find their way into the milk. They flow from the vulva down along the tail and thighs to the mammae and teats and frequently gain the orifice of the teat canal, pass into the gland and cause mammitis. When the fetal membranes are retained and hang down against the milk glands, infection of the posterior quarters is especially probable. Hence, while the milk of a cow apparently carries valuable protective substances against the bacteria in the digestive canal of her calf at birth, it also is extremely



Fig. 4.—Preputial tufts of calves at about 85 days. On the left is shown the matted tuft, stained black, of a dairy calf fed in the ordinary manner on mixed raw milk; on the right is the clean tuft of a calf taken from same herd and fed upon boiled milk. (From An. Rep. N. Y. State Veterinary College at Cornell University.)

liable to contain the same bacteria in more or less dangerous proportions.

That cows' milk regularly contains bacteria which profoundly affect the general health and appearance of calves is quite conclusively shown experimentally. If an apparently healthy bull calf, born in an ordinary dairy herd is fed in the prevailing manner upon raw milk, the tuft of hairs about the sheath opening, at first clean and of the color of its contiguous coat, soon becomes stained black and matted together as shown in Fig. 4. The staining and matting persist throughout life. But the other calf shown in the same figure, taken from the same herd and cared for as nearly as possible in the same manner, except that all milk fed to it had been boiled, shows the tuft of hairs clean, unstained and separate. I have repeatedly tried

this experiment and can find no explanation for the striking difference except that the one was fed on raw, the other on cooked milk. At one time there was so strong a belief current that a calf could not be grown upon boiled milk that the accuracy of my work was doubted.

I then took two calves from their dams at birth and fed them exclusively upon milk held at 30 pounds pressure in an autoclave for one-half hour. The milk was browned to a coffee color by the high temperature. The calves were exceptionally vigorous and grew rapidly as indicated by Fig. 5.

These data regarding calf infections at once raise the question whether they are peculiar to the species or whether they illustrate a common principle and that the genital tract in all its parts and the alimentary tract of the included young are constantly threatened and



Fig. 5.—Calf at about 85 days grown upon autoclaved milk. The preputial tuft is clean but wet from recent urination.

commonly invaded by bacteria of pathogenic power. So far as researches in domestic animals have gone, the data are in harmony for all. Horses, sheep, goats, swine, dogs and cats suffer like cattle but the studies in these infections have not gone so far and cannot be pursued so readily. Sterility and abortion of adults and diarrhea or other equivalent of the newborn are common alike in all.

The analogy is not confined to mammals. In the domestic fowl there is a common bacillary invasion of the ovary from which the ova acquire infection. The egg may fail to hatch, but usually incubation is completed with the bacilli persisting in the alimentary tract and yolk sac, where soon after hatching they cause a fatal diarrhea resulting in annual losses which poultry producers compute in millions of dollars.

Members of the medical profession apparently do not believe that genital infections are so common in people. They recognize of course the frequency of syphilis and gonorrhea, which cause an appalling

degree of disease and suffering and great interference with reproduction. In these diseases the uterus and the fetus are presumably invaded by the specific organisms but it seems to be believed that aside from these the uterine cavity and the included fetus and its membranes are commonly sterile. This view is possibly influenced by a belief that the uterus and embryo *should* be germ free. Some may believe that the placental arrangements more effectually bar infection from the gravid uterus and fetus of woman than of the cow. There are considerable variations in placental arrangements in different species of domestic animals but each fails to perfectly exclude infection from the uterus or to guard the embryo. In some respects the placental arrangements of the mare appear more perfect as a bacterial barrier than the placental structures of woman. In the latter the uterine cavity lined by the decidua vera persists until mid-term, while in the former the chorion at once comes into relation with the endometrium throughout by means of active placental structures. The only apparent advantage of the placental arrangement in woman is the comparatively inactive layer of decidua reflexa separating the uterine cavity from the chorion, but infection in the uterus and fetus is common and destructive in the former. In each, as in all mammalia, the uterine cavity has three openings which persist throughout pregnancy, the os uteri internum and the two openings of the oviducts. These canals afford the chief bacterial foci in all species from which infection may invade the uterus and embryo. The opportunities for the study of infection in the gravid uterus and the alimentary tract of the fetus are so infinitely superior in cows that this fact possibly explains in part the difference of view. It is not improbable that the view of the medical practitioner that the digestive tract of the newborn child is bacteria-free is based partly upon a study of the meconium near the anus. The study of bovine fetuses in the abattoir shows that culturable bacteria are most numerous in the stomach and fewest at the posterior end of the rectum. Consequently if the medical practitioner bases his conclusion upon a study of the rectal meconium he may fall into error.

The common existence of infection in the gravid uterus of the cow induces the veterinarian to assume the probable presence of infection in the puerperal uterus and to take measures to anticipate its explosion instead of awaiting clinical evidences of disease. Apparently the medical practitioner generally prefers to abstain from invading the puerperal uterus lest he introduce extrinsic infection. Writers upon obstetrics and gynecology make it clear that the medical practitioner is frequently disappointed by unexpectedly finding alarming puerperal infection which he attributes to faulty technic in excluding it, when if the analogy holds true the error may some-

times well be a failure to anticipate injury from an intrauterine infection persisting from pregnancy. The plan outlined for the prophylaxis of puerperal infection in cattle is amply justified by clinical experience, just as clearly, I believe, as is the practice of the obstetrician when he instills silver nitrate solution into the eyes of the newborn to guard against the possible presence of the gonococcus. The analogue of the one-child sterility of the gynecologist is highly destructive in heifers but so far as at present shown may be reduced to a negligible amount by assuming the probable presence of important intrauterine infection in each animal.

VITAL STATISTICS OF 18 HEIFERS GIVEN ABORTION BACTERINS IN FIRST PREGNANCY, WITH THEIR FEMALE PROGENY.								REMARKS
NUMBER	BORN	1912	13	14	15	16		
1	29	A						Destroyed 10.12. Gangrene of uterus. Decomposition of Fetus
2	29	A						Died of metritis
3	11	A						Slaughtered on account of sterility
4	10	A	A					Slaughtered on account of sterility
5	10	A	A	S				Slaughtered on account of sterility
6	10	A	B	A	H	B		Slaughtered on account of sterility
6A	13					B		
7	10	A	B	D				Died of metritis
8	11	H						Slaughtered on account of sterility
8A	12		A					Slaughtered on account of sterility
9	10	B						Retained afterbirth. Sold on account of inefficiency
10	11	A	D					Sold on account of Bad Udder. Gangrene. Half Amputated
11	11	A	B	D	B			Sold on account of low Dairy efficiency
12	10	A	H	B				Died of Indigestion 1915
12A	13			H	H			
13	10	H	B	H	B			Sold - efficient
13A	12		A	H	B			
14	10	H	B	D	B			
14A	12			H				Sold - efficient
15	10	B	H	D	D			1912 Heifer died 2.11.14
16	10	A	D	D	D	H		
17	10	A	H	B	H	H		
17A	13			B	S			
17B	15							
18	10	A	H	H	H	B		1914 Heifer died from Indigestion
18A	13					B		

Died or Killed ---- 10  
 Sold in Breeding Condition 5  
 Remaining in Herd  
 (of Dairying Age) 11

Died or Killed --- 10  
 Sold in Breeding Condition 5  
 Remaining in Herd  
 (of Dairying age) 11

—Chart showing Influence of *B. abortus* Bacterins Upon the Prevalence of Abortion.

Fig. 6.—Chart showing low fertility in group of heifers severely ill from diarrhea as calves and carrying severe genital infection until adult age. (From An. Rep. N. Y. State Veterinary College at Cornell University.)

The assumption also that the newborn calf carries pathogenic bacteria in its digestive tract at birth, paves the way for prophylactic measures of great value and makes it possible to generally control the devastating diarrhea and associated phenomena. In doing this, however, precautions against postnatal infections are not abated.

One of the most intensely interesting studies in bovine genital diseases is the influence of prenatal or early postnatal infections upon the fertility of the individual as an adult. Some wideawake breeders promptly destroy prematurely born calves because in their experience they are largely sterile, or if females and they conceive, they probably abort. My clinical observation approves this stand as well as the destruction of calves born at full term but unable to stand up



promptly because of sepsis due to prenatal infection. In many large herds virtually all calves suffer severely from diarrhea and pneumonia and when the surviving females reach breeding age, sterility is common, abortion in first pregnancy is a scourge, retained fetal membranes is very prevalent and unless energetic preventive measures are promptly applied, one-calf sterility is severe. Thus in Fig. 6 a group of 18 heifers representing the entire heifer crop in the herd for the year, all of which suffered severely from diarrhea as calves and were due to calve in 1912 and which ideally should have increased in 1916 to 49 females of breeding age, had decreased to 16 or a deficit from the ideal of 67.3 per cent. In a large herd shown in Fig. 7 where calves suffered severely from diarrhea and pneumonia, out of a group of 593 heifer calves 31 per cent died early and 27.8 per cent eventually became pregnant, of which 44.1 per cent aborted. A change was made in the rearing of calves by which the disease was ameliorated and out of 904 heifer calves, 44.1 per cent conceived as compared with 27.8 per cent and of those in which pregnancy had terminated, only 9.8 per cent aborted instead of 44.1 per cent while

<b>Calf Scours and Pneumonia, and Abortion and Sterility in Herd B.</b>											
Time Covered	Heifer calves born	Died of Scours and Pneumonia	Sold as Sterile	Killed account Tuberculosis	Miscellaneous Deaths	Sold for Veal	Conceived	Pregnancy terminated		In Herd pregnant	In Herd not bred
May 1 1909 to Aug. 31 1912 40 months	593	n° 184	8	56	57	118	170	95	75	0	0
		% 31	1.4	9.4	9.6	19.9	27.8	55.9	44.1	0	0
Sept 1 1912 to Oct 31 1916 50 months	904	n° 203	6	13	38	0	382	203	22	157	245
		% 22.4	0.6	1.3	6.4	0	44.2	90.2	9.8	17.4	27

—The Relationship of Calf Dysentery and Pneumonia to the Prevalence of Abortion in First Pregnancy.

Fig. 7.—Chart showing influence of the health of young calves upon their fertility as adults. (From. An. Rep. N. Y. State Veterinary College at Cornell University.)

17.4 per cent were still pregnant and 27 per cent unbred. A careful study revealed no other reason for the great increase in reproductive efficiency except the improved health of the young calves. These are in entire accord with general observations.

In harmony with this we have found that in experimental calves slaughtered at from 8 to 12 weeks old, those which were vigorous at birth and remained healthy, generally yielded no bacterial growths from cultures made from the cervix, uterus, oviducts or ovaries. On the other hand, cultures were generally obtained from these organs in calves which had suffered from diarrhea or pneumonia, and these cultures corresponded generally with the bacteria commonly found in the gravid uteri of cows. So the conclusion logically followed that diarrhea and pneumonia in calves being due to prenatal, or to early postnatal infection by the same organisms, the bacteria have an affin-

ity for the genital tract. The diarrhea opens a gateway to the blood stream, the bacteria lodge in the genital tract of the calf and lie dormant until puberty. Then in the heifer they invade the ovary from the oviduct through the crater in the ruptured ovisac, cause cystic degeneration of the corpus luteum, which leads to irregular ovulation and consequent irregular menstruation. The intermenstrual pause is irregular and the quantity of menstrual blood variable. With these are associated sterility, abortion, etc. If the analogy holds true even in part, it opens to the medical practitioner a highly interesting and important field of inquiry which has apparently received scant attention. It suggests additional reason for the more careful handling of children, not alone with a view to lowering infant mortality but also to guard the powers of reproduction and through these the general health.

There is a tone of uncertainty in medical literature regarding the part played by the man in sterility and abortion. It is clear of course that destructive disease of the testes or occlusive lesions of their excretory ducts render him sterile. His ability to transmit syphilis and gonorrhea is unquestioned. But outside of these there appears to be no definite understanding. The gynecologist busies himself chiefly with the genital organs of woman and incidentally studies the man but is frequently not clear in his conclusions as to which of the pair is responsible for sterility or abortion. There appears to be a marked general tendency to regard the woman as the chief obstacle instead of regarding husband and wife as equal partners in the problem of procreation.

The polygamy of cattle breeding affords a far better opportunity for observation because the influence of the male can be studied in a large group of females and compared with that of another male in the same herd. Thus in a purebred herd reproduction had been satisfactory for several years when the establishment purchased a young, unused male as an outcross for the heifers sired by the old bull. The young bull came from a herd where the calves suffered much from diarrhea. As soon as he was put into use, trouble, in the form of sterility, abortion, metritis and retained afterbirth, began among his cows while the old herd sire continued to breed satisfactorily. After two years I examined the young bull and discovered a large, indurated abscess of the left seminal vesicle with rectal adhesions, as shown in Fig. 8. The median sagittal section in Fig. 9 shows that the abscess has ruptured into the rectum at 6'. Evidently the bull had been ejaculating bacteria with his semen, but when the abscess formed the contamination of the semen ceased to be possible from all that part of the left gland anterior to the posterior abscess wall.

The result of copulation by this bull is well shown in Fig. 10. In

1918 the original herd sire, designated No. 1, bred satisfactorily, the herd increment being 96.3 per cent. Bull No. 2 then came in. During 1919 and 1920 No. 1 continued to breed well, showing a herd in-



Fig. 8.—Abscessation of left seminal vesicle seen from above. (For explanation of numbers, see legend of Fig. 9.)

crement of 90.0 and 93.3 per cent respectively. During the same period No. 2 showed a high rate of sterility, very high abortion rate (23 per cent) and an abundance of metritis. His herd increment was 46.16 per cent and 57.14 per cent respectively or a trifle over 50 per cent of that of the old sire.

The metritis recorded represents only those cases where it was severe and attracted definite clinical attention.

After bull No. 2 had been killed and it was attempted to breed his cows to No. 1 and to two young bulls, it appears that the infection which the bull had ejaculated in his semen had acquired an enduring



Fig. 9.—Section through abscess of seminal vesicle shown in Fig. 8.

1, Pelvic urethra and prostate; 2, prostatic body; 3, ampulla of right vas deferens. 3' cross section of right ampulla; 4, 4, right seminal vesicle; 5, 5, left seminal vesicle; 6, portion of rectum adherent to vesicle; 7, urinary bladder; 8, section through left seminal vesicle showing numerous pus areas; 9, large abscess; 10, section through sclerotic abscess wall; 11, fistula extending from the abscess cavity 9, into the rectum at 6'.

pathogenic habitat in them. In 3 cows bred to No. 1, not previously bred to No. 2, each conceived with a single coitus while in 15 females which had been bred to No. 2 there was a sterility of 33.3 per cent which with an abortion rate of 6.7 per cent reduced the calvings to 60 per cent.

The picture I have drawn of bovine genital infections, as an endless infection chain might well suggest the possibility of a parent transmitting such contagion to its progeny, and depressing their reproductive powers. Few data are available. In Fig. 11 the breeding records of three sires in one herd are recorded. Bulls Nos. 1 and 2 were of low fertility, averaging one calf for each 3 copulations while No. 3 was of high fertility. The female progeny of No. 1 have averaged 1.8 calves each, No. 2, 1.9 each, and those of No. 3, 3.7 each. The ratio of calves per female for No. 3 equalled the combined reproduction of Nos. 1 and 2. There are many cross currents of infection

BREEDING RECORDS OF HEALTHY AND DISEASED BULLS IN A PURE BRED HERD													
YEAR	BULL	NUMBER COWS	COPULATION	STERILITY		ABORTION		CALVES		METRITIS <sup>(1)</sup> %		AVERAGE DURATION OF GESTATION IN DAYS (2)	HERD INCREMENT % (3)
				NUMBER	%	NUMBER	%	NUMBER	%	FATAL	RECOVERED		
1918	1	27	40	1	3.7	0	0	26	96.3	0	0	285.96	96.3
1919	1	20	22	2	10.0	0	0	18	90.0	0	5	285.06	90.0
1920		15	20	2	13.3	1	6.7	14	93.3	0	0	282.79	93.3
1919	2	13	19	1	7.8	3	23.1	9	69.2	23.1	15.5	278.44	46.16
1920		21	30	4	19.0	5	23.8	12	57.1	0	19.0	276.0	57.14
1921	1(a)	3	3	0	0	0	0	3(4)	100.0	0	0		
1921	1(b)	15	22	5	33.3	1	6.7	9(5)	60.0	0	0		
1921	3(b)	6	7	6	100.0								
1921	4(b)	3	3	2	66.7	0	0	1(6)	33.3				

Fig. 10.—Chart showing breeding record of diseased (No. 2) bull of Figs. 8 and 9, compared with the healthy bull (No. 1).

(1) Only marked clinical cases of metritis or retained fetal membranes included; (2) abortions not included; (3) herd increment calves added by birth minus cows dead of genital infections; (4) two had calved and one was pregnant; (5) pregnant at date of report.

in a large herd where polygamy and polyandria are profuse, so that a given stream of infection cannot be accurately traced for a long distance but the limited available data seem to indicate that chronic genital infections are transmitted with a considerable degree of fidelity except scientific measures are taken to control them. In cattle as in men, there are family lines which owing to low fertility tend to become extinct. It is ordinarily attributed to some hazy weakness of reproductive powers. Researches in cattle appear to indicate that in them the explanation lies in the intensity of the genital infection present and its transmission to the progeny.

In the discussion of reproduction and sex hygiene there is frequently heard the term *sexual excess* but so far as I know, no attempt has been made to define it concretely. The polygamy of cattle breeding enables one to observe the direct effects of the frequency of copulation upon the male. In Fig. 11 there is shown a wide variation in the frequency of coitus by the three bulls. No. 1 was evidently highly infected and became useless early. His reproductive efficiency was very low and fell rapidly after he had reached the summit of copulation in his fourth breeding year. No. 2 was looked upon as the most valuable sire and was used far more than the other two combined

CHART OF THREE BULLS IN A LARGE HERD													
NUMBER	YEAR	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	TOTAL	FEMALE PROGENY
1	COPULATIONS		4	21	48	77	45	16	2			213	32
	% CALVES		50	48	40	34	22	19	0			33	
2	COPULATIONS	8	39	82	117	73	106	106	86	64	10	691	85
	% CALVES	100	33	34	32	27	39	27	26	28	90	32	
3	COPULATIONS	23	70	61	37	35	6	0	3	2	1	213	44
	% CALVES	83	54	33	41	40	0	0	33	0	0	50	
													CALVES PRODUCED FEMALE PROGENY

Fig. 11.—Breeding chart of three bulls showing decline of fertility with comparative fertility of their female progeny.

and during several years made more than 100 copulations per annum. They were distributed throughout the year but the breeding was heaviest during the spring. At times certain bulls made 2 and rarely 3 copulations a day. All three bulls (as well as 11 others in the herd) show a somewhat even decline in fertility from the beginning and it appears to be hastened as the number of copulations per annum advances. No. 3, being rather unpopular as a sire, was not so extensively used. His fertility was higher and better maintained, his progeny were more vigorous and far more fertile, and in the second generation he far outranks the other bulls. These fragmentary data appear consistent and so far as can be seen are in accord with general clinical experiences. The frequency of coitus, the fertility, the

security of pregnancy, puerperal infection and fertility of progeny are interdependent.

In studying breeding bulls it is found that the most available data are obtainable from the palpation of the seminal vesicles and the examination of the spermatozoa. Important lesions of the testicles and epididymes are often unrecognizable by palpation. When these become clinically evident the bull is usually hopelessly and completely sterile, but as a rule he is not dangerous, because the lesions inhibit ejaculation and hence the infection remains imprisoned. It is the bull of low fertility that is most frequently dangerous to the female. He is also in peril of becoming hopelessly sterile unless prompt sexual rest is provided.

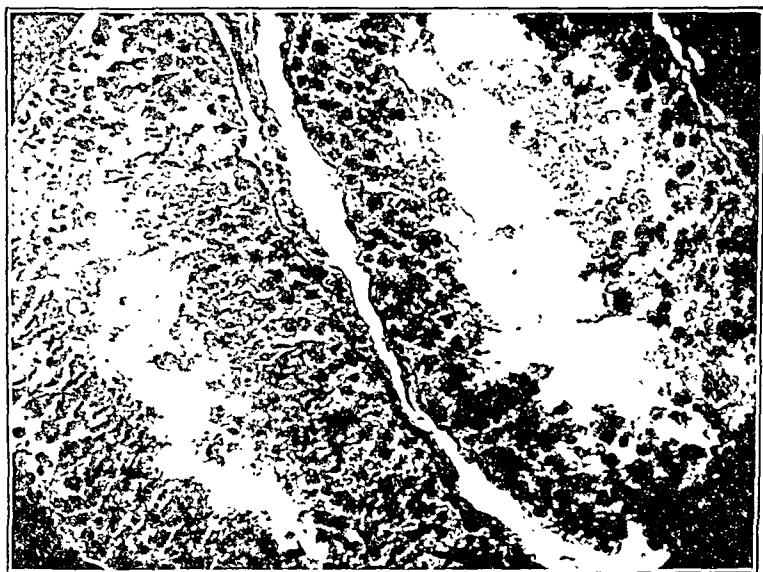


Fig. 12.—Seminiferous tubules showing desquamative orchitis without clinical evidences. In one tubule some spermatozoa are still being formed; in the other the destruction of the germinal epithelium is much advanced.

The two outstanding means for recognizing these dangers are changes in volume, consistency or sensitiveness of the seminal vesicles or abnormalities in the spermatozoa. Sexual activity when it reaches four to seven copulations per week as a rule is soon reflected by the condition of the seminal vesicles but important lesions have already occurred in the mucosa of these before the abnormalities are palpable.

The abnormalities in the spermatozoa may vary widely. Defective motility or total nonmotility indicates high virulence of infection in the seminal vesicles or elsewhere in the course from the testicles to the urethra. Usually the first signal of danger is an increase in the number of defectively formed spermatozoa, such as abnormal form or size of the head. When the abnormally formed spermatozoa reach

about 70 to 90 per thousand, the fertility becomes recognizably low, the pregnancy insecure and the cow is liable to reveal clinical evidences of cervicitis, salpingitis and cystic degeneration of the corpus luteum.

The testicles of such bulls show interesting histological changes. Fig. 12 shows two contiguous seminiferous tubules. In one the germinal epithelium is partly destroyed but spermatozoa are still being formed; in the other the destruction is much farther advanced and its products are chiefly debris and bacteria. In Fig. 13 the destruction is further advanced and the germinal epithelium almost totally destroyed. Such lesions are not clinically recognizable.

Clinically the average bull cannot with safety make nearly 100

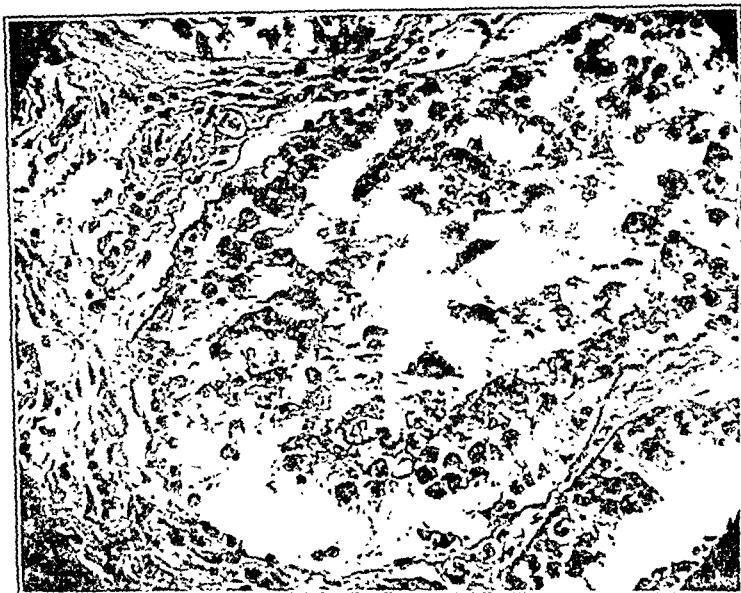


Fig. 13.—Orchitis with almost total destruction of the tubal epithelium.

copulations per annum. Individual sires doubtless may rarely exceed this with safety but this cannot be told except by taking the risk of doing serious injury, both to the prospective fertility of the bull and to the genital health of the cows with which he copulates.

I have not attempted to discuss the identity of the infections mentioned. Most bacteriologists who have studied the problem of reproduction in cattle have limited their researches to one microorganism, the *Bacterium abortus* of Bang and have ignored all other bacteria as of no consequence. The infections here discussed have not, so far as known, any relation to the *Bacterium abortus*. The most prominent organism observed by the very few workers who have paid any attention to the genital flora as a whole, is a streptococcus of the viridans group. There also occur micrococci, staphylococci, bacilli, spirilla, etc. None of them are at present recognized as specific but



rather as belonging to that group of infections which may be designated *general* and not readily distinguishable from the bacteria of wound infection. In a sense they apparently repeat in the genital tract analogous bacteria normally resident upon the skin, virtually harmless upon the unbroken surface with high potentiality for harm when a wound occurs.

The important point is that sexual excess has in cattle a concrete meaning. The data are as yet fragmentary but capable of unlimited extension by research.

(For discussion, see page 563.)

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## THE TREATMENT OF PUERPERAL SEPSIS BY THE USE OF MERCUROCHROME INTRAVENOUSLY WITH A REPORT OF ANIMAL EXPERIMENTATION IN THE CHEMICAL DISINFECTION OF THE BLOOD\*

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THE subject of puerperal sepsis and its treatment has been the cause of acrimonious discussion within the medical profession since the days of Hippocrates. Most of this discussion has been upon the etiology and the predisposing factors in the causation of this condition. Arnold Lea has a very clear cut and a delightful description of the historical side of this controversy. He speaks of "puerperal infection as the general term applied to all infected conditions which arise from the entrance of organisms into wounds of the generative tract in connection with labor or the puerperium," and further states that "all cases of fever during the puerperium, unless clearly attributable to some extraneous cause, should be considered as forms of wound infection." Polak in his monograph on "Pelvic Inflammation" states; "we know from clinical experience that the presence of decidua or a piece of placenta retained in the uterus will not cause endometritis unless infection is also present," and also that "puerperal fever is primarily due to infection of the obstetrical wound by microorganisms."

Mercatus, writing in 1570, was apparently the first observer to mention putridity of the lochia as an essential feature of the disease. In 1843 Oliver Wendell Holmes published his classical essay on the contagious nature of the condition.

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†(The author wishes to extend his thanks to Dr. Thomas McMillan of Philadelphia by whom the actual laboratory work was done, both in the original animal experimentation and the clinical controls.)

All students of this condition now agree there must be two things to cause puerperal sepsis. First, the presence of an obstetric wound and second, the presence of a pathogenic organism. Of necessity there must always be the obstetric wound and according to Polak's observation, 50 per cent of patients examined showed bacteria in the uterine cavity six or seven days after delivery. It would therefore appear that if these were the only two factors in the presence or absence of puerperal sepsis, its occurrence should be more frequent than it is at present. Fortunately however, the factor of the individual resistance is probably the greatest determining factor for or against the presence of local puerperal infection.

The term puerperal sepsis is, I believe, used very loosely. From the point of view of treatment alone it would seem necessary to make some distinction between puerperal sepsis, as a blood-stream infection, and as some local infection of the birth-canal. We may say in the old truism we were taught in logic, all cases of puerperal sepsis are puerperal infections but not all cases of puerperal infection are puerperal sepsis.

We are not considering here the absorption of the toxins from retained lochia. We all know that this frequently gives rise to all the symptoms and the graphic temperature chart of a true puerperal sepsis. It would be difficult to differentiate between a puerperal septicemia unproved by positive blood culture and a beginning localization where no localized symptoms have yet presented themselves. We have all seen those cases in which we have, not only a true septicemia but also the local condition as well. The most frequent of these, probably would be streptococcic peritonitis with an infection of the blood stream by the same organism.

As stated before, practically all cases of septicemia are due to infections implanted upon some obstetric injury to the maternal birth canal, but we must not lose sight of the fact that a woman in her early puerperium would be more likely to contract a blood stream infection from some extraneous cause, such as abscess of the teeth, etc., than she would at any other time, though this is rare.

It would seem therefore extremely difficult to differentiate between puerperal infections and puerperal sepsis but as a suggestion it would appeal to me that the latter term should only be used in those conditions, in which there is a definite proof of transmission of infection by the blood stream or lymphatics from the birth canal, and that we speak of every other infection depending upon the child-bearing act as a puerperal infection.

Treatment, in puerperal infection, might be divided into supportive, eliminative, local and blood stream. Under the supportive treatment would come stimulation and feeding. Naturally all cases would

be treated symptomatically. The replies to a questionnaire, sent out by Dr. Hirst, to some of the teaching hospitals, have shown considerable divergence of opinion along different lines of treatment. The question of alcoholic stimulation is fairly evenly divided. We believe in it strongly and use it in large amounts, also the administration of glucose by proctoclysis. We have used nuclein in the attempt to increase the leukocytes, and also autogenous antistreptococcic vaccine, the latter having very excellent results but unfortunately in the very serious cases, which terminate rapidly, we cannot wait for the preparation. In that type of case nothing seems to be of any value.

As to elimination, we keep the bowels open, give water by mouth when possible, otherwise by proctoclysis.

Under local treatment the much mooted subject of the intrauterine douche must be brought up. It is our practice in the University Maternity to irrigate with a return flow intrauterine douche tube those cases which show symptomatically the suspicion of some retention, or where there is a sudden stoppage of lochia, and in those cases where there is an occasionally foul discharge. This is not done with the idea that it is a specific cure for a general infection. We do not believe that we can cure any cases of blood stream infections by this method, but that in this manner we establish good drainage and attempt to keep the endometrium as clean as possible. The force of the flow is not sufficient to do any damage by way of the tubes. We do not believe that we have ever seen any bad results from this practice and we are sure that we have seen many cases rapidly clear up, but it must be understood that it is never done except for a local condition. As to operative treatment, where localization has definitely occurred, I believe that it is generally agreed that, where possible, it should be drained from below, but where there is a definite cornual abscess, suppurative metritis, infection and suppuration of the upper portion of the broad ligaments, tubes and ovaries or localized suppurative peritonitis above Douglas' pouch, we open the abdomen and drain.

Since 1900 there have been many different methods of intravenous treatment for puerperal septicemia, bichloride of mercury, magnesium sulphate, protargol, colloidal silver, eusol, phylacogen, arsenobenzol, formic aldehyde, phenoiodine, ammoniosulphate of copper and others.

Most of these have been reported to be attended with some degree of success. Polak's frequently repeated small blood transfusions have given excellent results in some cases. Antistreptococcic serum has given brilliant results in some cases and others were entire failures. When we use it, we do so in doses of 100 c.c. intravenously. Colloidal

silver and arsenobenzol have given us no results whatever but I am informed that in other clinics they have cleared up cases brilliantly.

In the winter of 1920, I had the misfortune to have a patient develop puerperal sepsis. She was a multipara, delivered normally in the hospital without instruments, with, I believe but one vaginal examination before delivery. However, she was admitted to the hospital in labor the same day that a patient died of streptococcic septicemia. The cause of the death in this case was known at the time, and the most careful precautions were taken, and yet this patient was infected and virulently so. The case from the beginning to the end made a peculiarly deep impression upon me because I felt that, had her resistance been better, in spite of the unfortunate fact of the death in the ward, everything would have gone well, but this girl's resistance was below par, both physically and mentally. She had been deserted by her husband some months previously and her mental attitude, when I first saw her was one of entire indifference to her recovery. This factor may be fanciful, but I believe it to be of importance. During the time in which this case was under my observation and care, a great deal of my time was spent in consideration of methods and treatment, and as many before me have no doubt thought, if we could find a germicide which, injected in the blood stream would kill the microorganisms and at the same time not kill the patient, we would be well on the way to the cure of the condition. Young, White and Schwartz in their paper from the Johns Hopkins Urological Clinic on the local use of mercurochrome in infections of the bladder had stated that the toxicity of this preparation had been tested by the injection into the veins of a rabbit. It had been found that in the ratio of 5 mg. per kilo of body weight the animal showed no ill effects, but that in the dosage of 10 mg. per kilo of body weight the animal was killed, and that a dog was able to take 10 mg. without any apparent ill effect. This showed us that we had very little leeway as to dosage.

After a consideration of this report, the following experiments were then carried out by Dr. Thomas McMillan, of Philadelphia, with the aid and valuable suggestions of Dr. Herbert Fox, director of the William Pepper Laboratory. I may say that this work was not entirely unattended by danger. Dr. McMillan was confined to the hospital with a virulent hemolytic streptococcic infection of the hand. His successor in the work, Dr. Hoehn, the pathologic resident at that time, soon after was sent to the Municipal Hospital with scarlet fever. The latter part of the work was done by Dr. McMillan after his recovery.

## GERMICIDAL EFFECTS OF MERCUROCHROME "IN VITRO"

In their original work on mercurochrome, Young, White and Schwartz showed that this drug displayed a marked germicidal action on *S. aureus* and *B. coli* when these organisms were suspended in sterile urine.

They found that *S. aureus* was killed by a 1:5000 dilution of this agent in 5 minutes, while *B. coli* was killed in 15 minutes.

We attempted similar observations using defibrinated blood as the medium of suspension and a hemolytic streptococcus as the organism. The organism used was from a virulent case of puerperal septicemia. Blood agar slants were prepared from a 24-hour blood culture plate. These were incubated 24 hours.

Using the safe dose for the rabbit, 5 milligrams per kilo of body weight found by these workers, it was thought that in the human body this would represent a proportion of about 1:13,000 of the drug, therefore the dilutions used by us were 1:8000 and 1:16,000. In a 1:8000 dilution of mercurochrome in defibrinated blood, hemolytic streptococci were killed in 40 minutes. In a 1:16,000 dilution, plates prepared at the end of one hour showed two colonies. Those prepared after this showed no growth.

THE EFFECT OF MERCUROCHROME WHEN INTRODUCED INTO THE BLOOD  
STREAM OF NORMAL RABBITS

We were guided in the dosage used by the workers referred to above. In accordance with their findings an apparently healthy rabbit weighing 2.4 kilos was given mercurochrome intravenously in the proportion of 5 milligrams per kilo of body weight. The stock solution used was a 1 per cent watery solution. Before the introduction of this drug a urinalysis showed an apparently normal urine. A blood count was done before the introduction of the drug and this gave an entirely normal figure. At intervals after the initial and subsequent doses of this drug blood counts were repeated. Practically no change was noted in the red blood count, and the white blood count was found to vary in the different examinations not more than 3,000 cells. The differential count was not materially changed. Following the initial dose of this drug, identical amounts were given directly into the vein at 24-hour intervals for three days. During this time there was no demonstrable hemolysis as judged by the macroscopic test, hemoglobin determinations, red blood count or urine examinations. After these three injections at 24-hour intervals no drug was given for a day. The injections of the drug were resumed, however, now being given in the proportion of 7 milligrams per kilo of body weight at intervals of 48 hours until three injections

were given. Therefore, in 14 days this animal was given 10.6 c.c. of a 1 per cent solution of mercurochrome intravenously, the last three doses in the proportion of 7 milligrams per kilo. During this time we were unable to demonstrate any urinary changes except a questionable trace of albumin on two occasions; casts were never found. We were unable to demonstrate mercury in the urine. The rabbit was then killed. At autopsy, there were no lesions found in any organ. The kidneys were particularly studied; neither grossly nor microscopically could any pathologic lesions be demonstrated. After an examination of the organs, the skin of the rabbit was removed, the body macerated and examined for mercury. The test was entirely negative.

#### THE EFFECT OF MERCUROCHROME ON ARTIFICIALLY INDUCED STREPTOCOCCIC INFECTIONS

A streptococcus recovered from the blood stream of a case of puerperal septicemia was used for these tests. Realizing that the streptococcus lost its virulence when kept for any length of time on artificial media, a blood agar slant was inoculated from a colony of a 24-hour blood culture plate. For the first rabbit used this slant was incubated 48 hours; 2 c.c. of a normal salt solution were then added and the bacterial growth emulsified. One c.c. of this bacterial emulsion was then injected into the ear vein of a rabbit. Blood cultures were taken at intervals from this rabbit. Plates taken 26 hours after inoculation showed the most abundant growth. In this rabbit, blood cultures remained positive until 48 hours after the introduction of the streptococcus; after 56 hours the blood cultures were consistently negative, and the rabbit recovered. Feeling that we had allowed the organisms to remain too long on artificial media, blood agar slants were again prepared from 24-hour blood culture plates of this rabbit and incubated for only 18 hours. Bacterial emulsions were then prepared. Simultaneously 1 c.c. of this bacterial suspension was then injected into the ear of two healthy female rabbits of approximately the same age and size. One rabbit was allowed to run its course untreated as a control and the other rabbit was treated with mercurochrome intravenously.

The untreated rabbit showed positive blood cultures and died within 36 hours. Cultures from this rabbit were then prepared. The heart, lungs and other organs of this rabbit yielded streptococci in great abundance.

The rabbit treated with mercurochrome, twenty-four hours after the introduction of the bacteria, was comatose, lying on its side, with its head markedly everted, and with the cornea of the left eye almost opaque and the sclera much injected. A blood cul-

ture at 24 hours was strongly positive. At this time mercurochrome in the proportion of 5 milligrams per kilo was given intravenously. Blood cultures at 26 hours and 29 hours were strongly positive. Twenty-nine hours after the injection of the bacteria, and five hours after the injection of the mercurochrome, the animal was distinctly better and was sitting erect and eating; the head was still held somewhat everted. Eleven hours after the first injection the head was practically straight and the animal was eating heartily. Twenty-two hours after the first dose of the drug the animal was worse again, lying on its side, breathing shallow and rapidly. The eye condition was very much worse; a panophthalmitis was present with the anterior chamber filled with free pus. Blood cultures taken at this time were positive, 26 hours later or 48 hours after the first injection of mercurochrome, blood cultures were still positive, and mercurochrome in the same strength was administered intravenously. Seven hours after this injection, the blood culture was faintly positive, 24 hours after this second injection the animal was distinctly better, and the blood culture was negative. Blood cultures were taken at frequent intervals after this but no positive cultures were obtained. The cornea of the left eye was very opaque. Feeling that the infection was still active here in spite of the negative blood culture, a third dose of the mercurochrome was given; blood cultures again were negative, and the animal clinically practically well. However, we were misled by the appearance of the eye into believing that pus was still present. It was decided to attempt an enucleation of the affected eye. The animal did not survive the anesthesia. At autopsy we were unable to recover streptococci from any organ, and to our great surprise it was found that although the interior of the eye was destroyed, no streptococci could be obtained. The lungs showed signs of a recent pneumonia but no streptococci could be recovered. We feel that mercurochrome in this instance, saved the life of a rabbit that was comatose with a pneumonia, an eye full of pus, and a blood stream infection, following the introduction into its circulation of a virulent streptococcus,—a strain that caused another rabbit of approximately the same size and weight, to die in 30 hours.

Following the death of the untreated control animal, a bacterial suspension was prepared from a twenty-four hour old blood culture plate of this rabbit.

Another rabbit was then given mercurochrome intravenously in the proportion of 5 milligrams per kilo. One minute after the introduction of this drug into the blood stream, 1.5 c.c. of the streptococcic emulsion was introduced into the circulation. Blood cultures were taken at frequent intervals. These were consistently negative. Ninety-six hours after this procedure, an additional 1.5 c.c. of the

streptococcic emulsion was given the same rabbit in order to see if the effects of mercurochrome persisted. Blood cultures were positive at twenty-two and forty-eight hours. Blood cultures were negative at ninety-six hours.

During the observation on the rabbit treated with mercurochrome, blood cultures becoming negative, our streptococcus was allowed to remain on artificial media too long. Therefore when the next rabbit was injected the culture proved entirely innocuous. In an attempt to increase the virulence of the strain this organism was passed successively through six mice intraperitoneally. The virulence of the organism for mice was greatly increased by this procedure. However, we were unable to gain back a permanent and persistent virulence for rabbits in this organism. Some eighteen rabbits in all were injected with various cultures of this organism but without its ever gaining a uniform virulence. All told, we used over thirty animals, but the results in all cases were not at all conclusive, and, owing to the difficulty of getting uniformity in the animals themselves, other results were not satisfactory.

To sum up, we felt that the experimental work showed that mercurochrome could be introduced into the blood stream of rabbits in certain strengths without any demonstrable harmful effects. We demonstrated also that mercurochrome in dilutions, considerably weaker than those we are able to introduce into the blood stream had distinct germicidal power. We were unable to consistently set up an active blood stream infection in all rabbits. However, we believe that in the case of one rabbit, at least, an animal that was comatose and with an eye full of pus,—this drug manifested spectacular power. Further we believe that in that particular rabbit the drug not only cleared up the blood stream infection but it actually attacked and showed germicidal power upon the local lesions.

Following our experimental work, we felt that we were justified in attempting the use of mercurochrome clinically. But in order to be on the safe side, we at first only tried it on cases that were actually moribund. The first case in which it was used was a woman admitted *in extremis*. Her temperature was 105° F., pulse approximately 160, respiration 40 to 50, she was unconscious and had all the signs of diffuse peritonitis. The drug in her case reacted, as in our later work, with chill, the dropping of her temperature and pulse for a short time and then she promptly died. We tried this again on one or two other cases of a similar nature with the same results. Although these patients died we could see no way in which the mercurochrome had hastened their end, in fact we thought we saw some slight improvement even in these desperately ill individuals.

We used this treatment on other cases, five of which are herewith submitted.



CASE 1.—H. B. Patient admitted to the hospital with a severe thrombophlebitis of the lower extremity. We were unable to obtain a positive blood culture. For days and weeks she ran a typical septic temperature. She was given anti-streptococcic serum with no benefit whatever. She gradually became worse and worse until it was thought she could not possibly live more than 48 hours. It was then determined to try mereurochrome intravenously. At this time her leg was almost gangrenous. She was given repeated doses of mereurochrome, of a smaller dosage than we now know can be given safely. The reactions were very marked and she was always clinically better after each dose. At the time that the first dose was given, a blood culture was taken and subsequently found to be strongly positive. Later it became negative under treatment. The patient eventually died of what appeared to be streptococcic pneumonia. At the time of her death, the local lesion in her leg had practically cleared.

CASE 2.—H. S. Patient with a positive blood culture of streptococcus viridans. She was given repeated doses of mereurochrome with rather strong reactions, the

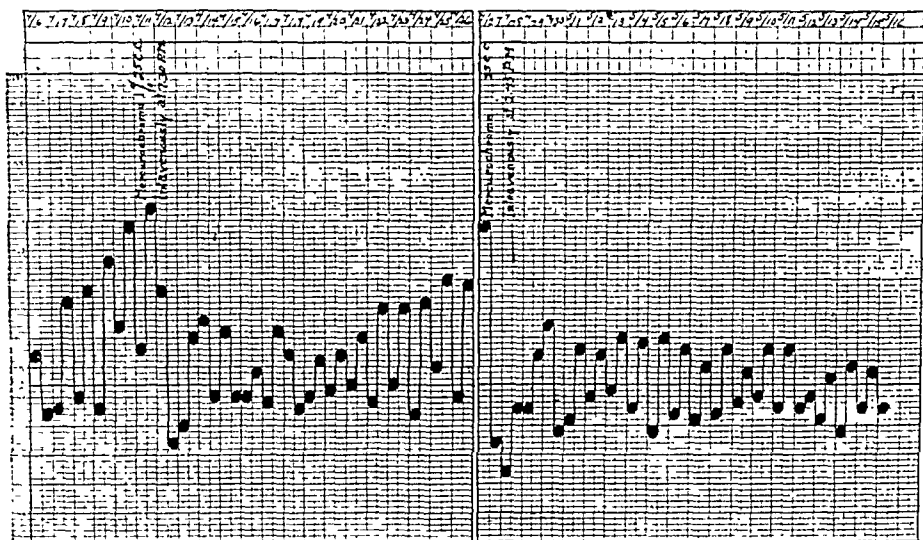


Fig. 1.—Temperature chart from a case of puerperal sepsis, showing high and low daily temperature and recissions after administration of the mereurochrome.

patient always became clinically better. Inasmuch as the results in this type of infection have been uniformly bad, with all kinds of treatment, I did not anticipate any good results. After some weeks of treatment, she insisted upon going home and subsequently it was reported that she died.

CASE 3.—S. S. Puerperal septicemia with a hemolytic streptococcus in the blood. She was treated with mereurochrome with very slight reaction, subsequently she was treated with antistreptococcic serum with no apparent benefit. Eventually the condition localized as a cellulitic phlegmasia of the lower extremity which was opened and drained and the patient made a good recovery. Whether the mereurochrome in this case was of any value cannot be determined but the patient eventually showed a negative blood culture.

CASE 4.—Case of puerperal sepsis of long standing, admitted to the hospital after two months. She had had a thrombophlebitis of the lower extremity which appeared to have improved. Soon after admission she became suddenly worse, the temperature mounting rapidly. Her blood culture showed a hemolytic streptococcus

and she was given mercurochrome. This patient received the largest dose we had ever given up to that time. Her reaction and clinical improvement, as can be seen by the chart (Fig. 1) was very satisfactory. For 12 days her highest temperature at any time was 100.4° F. One dose of the drug was all that was given for a period of two weeks. One week after the first dose her blood culture was negative. Since that time her temperature has risen again, and she was given a second dose, April 27, to which she reacted in the usual manner. Naturally, I am unable to give the end result but she appears to be better.\*

CASE 5.—Patient with a moderately severe case of pyelitis. She was not pregnant. She received two doses of mercurochrome three days apart. Her symptoms all disappeared but she still had pus in her urine. Her phthalein elimination was 30 per cent before her first dose and 35 per cent two days after her second dose.

In all cases there are a few points to be noted. The urine in all was typical of any severe infection. The mercurochrome did not change this in any way. The blood picture was in no way changed except that the leukocytes were somewhat increased in some instances. The phthalein test in one case was most satisfactory.

These cases are certainly not definitely conclusive that in mercurochrome we have found a specific cure for blood stream infections, but we feel that we may perhaps after more extensive observation find a way to increase the dosage, so that our subsequent results will be better. In a condition of this kind, in which there is some focus of infection, if we can kill the bacteria that are in the blood stream, the best we can hope for is that by so doing we can give the human organism a chance to cure itself.

The laboratory findings show that the dosage of the drug will of necessity be an important factor. Our original plan gave us a fairly good margin of safety. We gave that dose which was definitely shown to be nontoxic to the rabbit, that is, 5 milligrams per kilo of body weight. That would be about 25 c.c. of a 1 per cent solution of mercurochrome in distilled water for every 125 pounds of body weight. We definitely did not get as good results as we had hoped from this dosage. In case No. 4 as shown above, the dosage was somewhat higher, and based on her case, we feel safe that a nontoxic dose would be 25 c.c. of a 1 per cent solution per 100 pounds of body weight; in her case it was slightly larger. Naturally the body weight is an approximated figure.

The reaction that occurs is almost routinely the same. Within the first hour there may be vomiting; in less than two hours a definite diarrhea will commence. In the first six hours there will probably be a marked chill with a rise in temperature up to 105° F. Following this chill there will be a gradual decrease in temperature with a proportionate pulse rate decrease until the temperature reaches subnormal, gradually rising to normal or slightly above where it should

\*Subsequently, this case made a complete recovery and was discharged.

# THE USE OF SUTURES AS TRACTORS IN THE VAGINAL OPERATION FOR PROLAPSUS\*

BY THOMAS S. CULLEN, BALTIMORE, MD.

*From the Gynecological Department of the Johns Hopkins Hospital and the Johns Hopkins University.*

THE removal of the uterus for prolapsus is becoming a less and less frequent procedure. The value of the uterus as the keystone in the vaginal vault is more and more appreciated, and, unless malignancy is suspected or there be coexistent pelvic lesions indicating a hysterectomy, the organ is preserved.

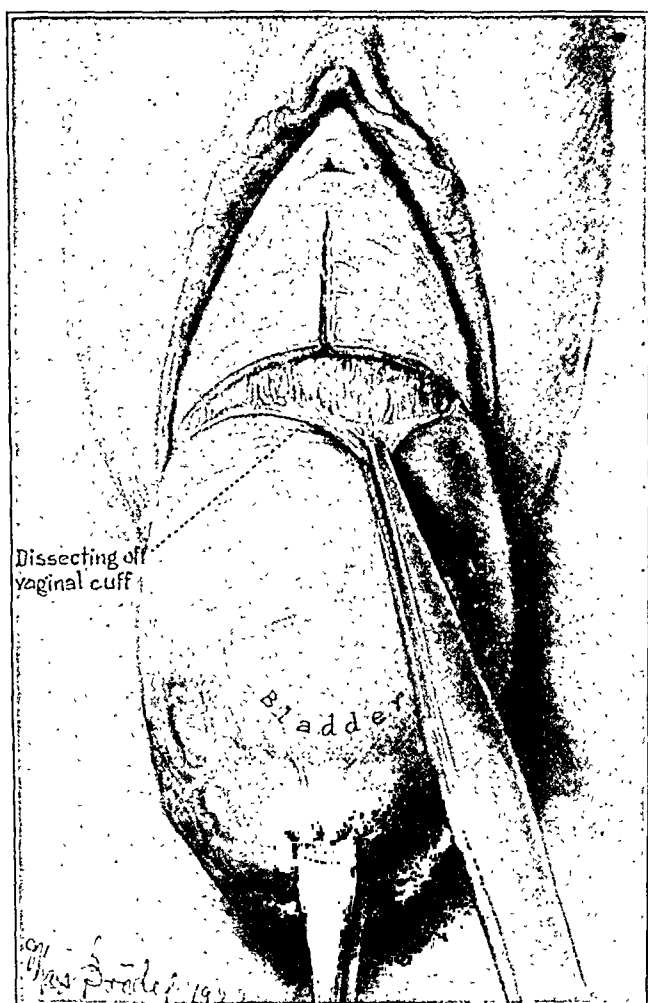


Fig. 1.—Strong traction is being made on the cervix. An incision completely encircles the vagina high up and a perpendicular incision extends from a point just below the urethra to the circular incision. The anterior vaginal mucosa is being dissected down. The bladder extends down almost to the external os.

\*Read at the Forty-seventh Annual Meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

The evolution in the improvement in the technic of vaginal operations for prolapsus has been a gradual one and numerous surgeons have had a share in its development. Inseparably linked with this improvement are the names of two distinguished members of this Association, Drs. Thomas J. Watkins and J. Riddle Goffe.

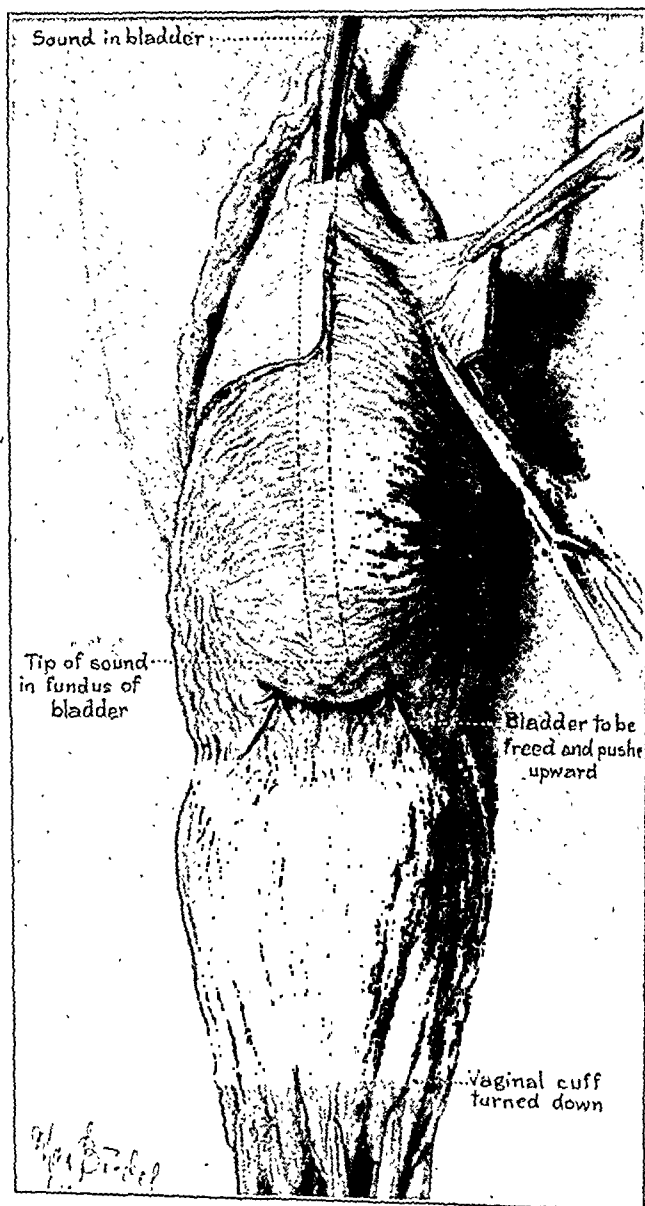


Fig. 2.—The anterior vaginal flap has been dissected down. As a rule the vaginal mucosa of the posterior wall is not disturbed until the cervix has been cut across. The left half of the triangular flap is being cut away.  
The sound shows the lower limit of the bladder.

In the few moments at my disposal I shall describe briefly the method which in the main we have found most satisfactory in the handling of uterine prolapsus. It is not new; it has been adapted almost in its entirety from a combination of the work of others. But I shall

also mention a new point in the technic which tends to render the operation a little easier and which at the same time diminishes the bleeding to some extent.

Although to the operator the various stages in the operation may be perfectly clear, to the student or to the onlooker, who is unfamiliar with the procedure it is a difficult puzzle. In the accompanying draw-

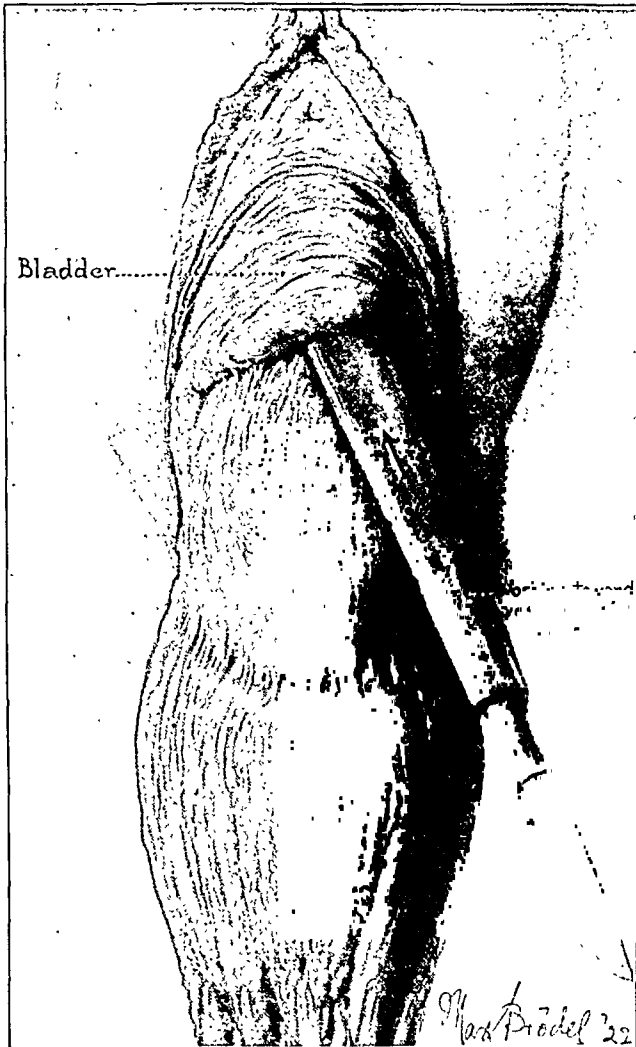


Fig. 3.—The bladder is being carefully dissected free from the uterus. The knife handle is near the vesical reflection of the peritoneum.

ings, made by Max Brödel, every step is rendered perfectly clear, so clear that the student of the future will have little or no trouble in following the operation from beginning to end.

In Fig. 1 we see the markedly prolapsed uterus with ulceration along one side. An incision has been made all the way round the vagina, after which a perpendicular incision is begun just below the urethral orifice and continued down to the circular incision.

In Fig. 2 the vaginal mucosa of the anterior wall has been dissected down nearly to the external os and the triangular vaginal flap on the left side is being cut away. The extent to which the bladder projects downward is indicated.

In Fig. 3 the bladder has been pushed up and separated from the upper part of the cervix and lower part of the body of the uterus.

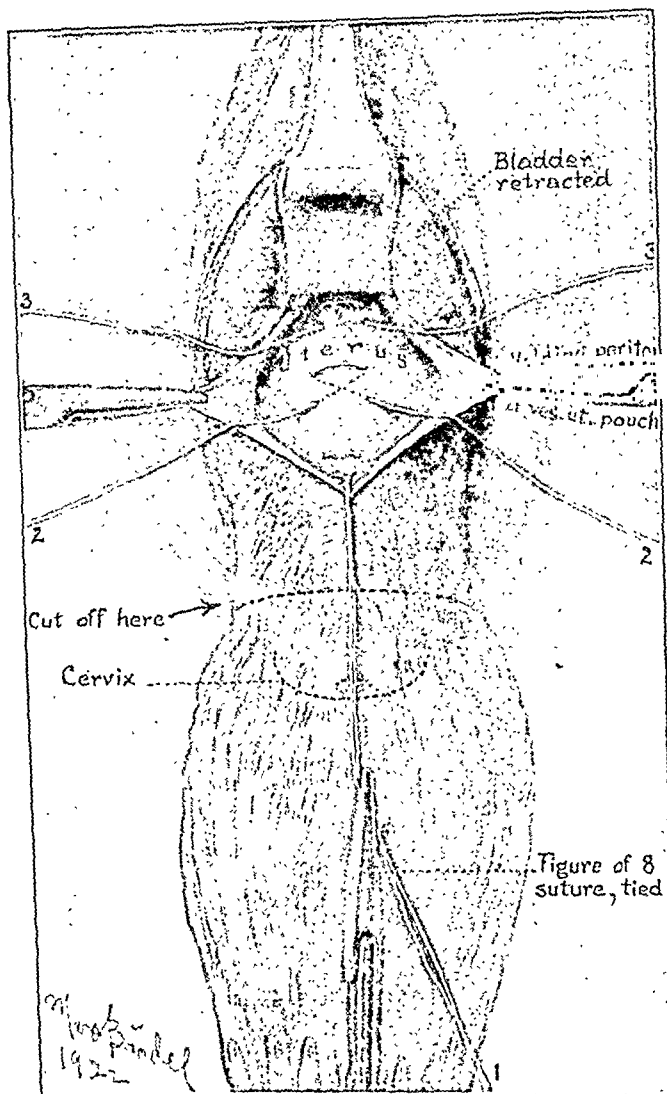


Fig. 4.—Insertion of the figure-of-eight traction sutures which later become the permanent fixation sutures.

Suture 1 has been introduced and tied. Traction has been made on this, more of the fundus exposed and figure-of-eight suture 2 introduced. This is usually tied; traction is made on it, and the third figure-of-eight suture placed and tied.

Any bleeding that may come from the needle holes is usually promptly checked when the suture is tied.

After the peritoneal reflection has been exposed I open it, and then instead of grasping the uterus with a tenaculum or other forceps I place a figure-of-eight suture of chromic catgut in the anterior wall of the uterus, going rather deeply into the wall but taking care not to

enter the uterine cavity. This suture is now tied and used as a tractor. This exposes more of the fundus, and a second figure-of-eight chromic catgut is placed and tied. The first suture is now dropped and traction is made on the second suture. More of the fundus is exposed and a third figure-of-eight is inserted and tied. The entire procedure is shown in Fig. 4.

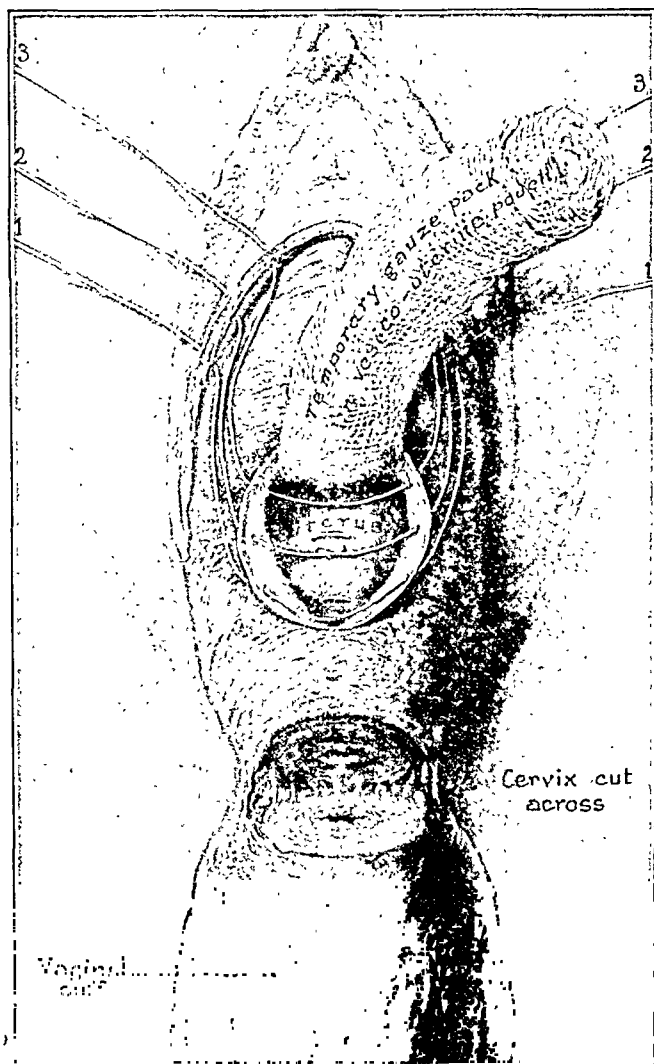


Fig. 5.—A piece of gauze is temporarily placed in the peritoneal opening to prevent the escape of blood from the vagina into the abdomen.

The ends of the figure-of-eight sutures are re-threaded, passed through the peritoneum and then through the edge of the vaginal mucosa, as indicated.

The cervix is now partially cut across, the cervical canal dilated; then the cervix is severed and the vaginal mucosa of the posterior wall dissected away with the cervix.

After the three figure-of-eight sutures have been placed, the end of each is rethreaded, passed through the peritoneum and then through the edge of the vaginal mucosa. This is clearly seen in Fig. 5. After these sutures have been placed, they are clamped, and a small gauze

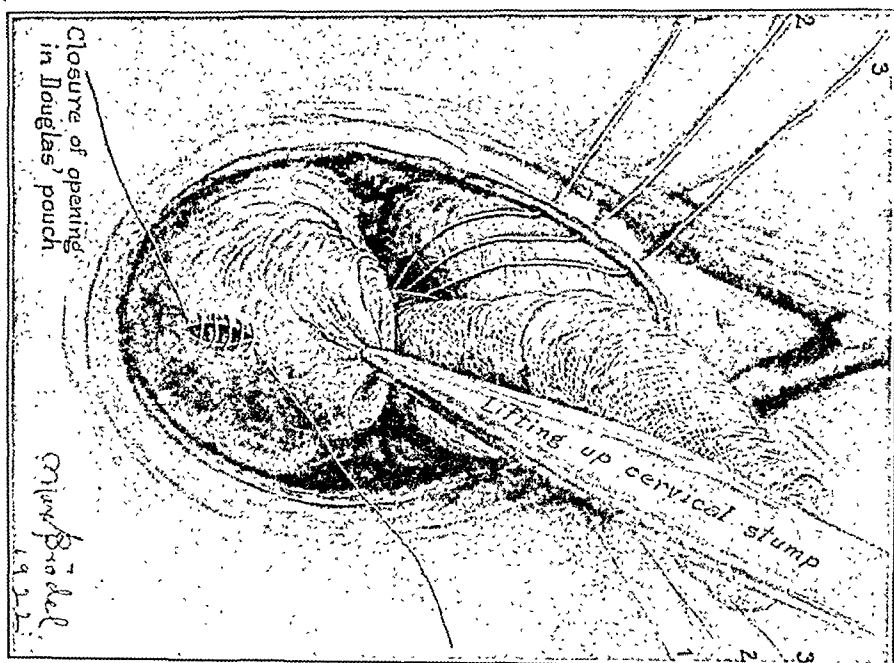


Fig. 6.

Fig. 6.—Closing a small opening into Douglas's culdesac accidentally made when the vaginal mucosa was being dissected free. In some of these cases there is little or no intervening tissue between the vaginal mucosa and the pelvic peritoneum.

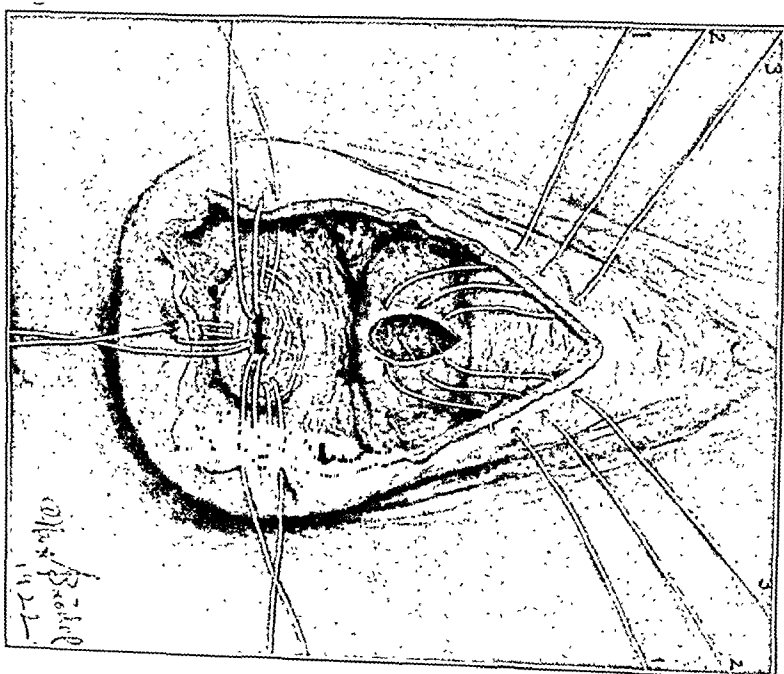


Fig. 7.

Fig. 7.—Approximating the vaginal mucosa to the cervix. Where possible figure-of-eight sutures are employed.



pack is temporarily placed between the bladder and fundus, in order that no blood may escape from the vagina into the peritoneal cavity.

Strong traction is now made on the uterus, and the cervix is cut half way through as indicated. Before it is completely severed, however, the cervical canal is well dilated.

After the cervix has been completely cut through, the mucosa of the posterior vaginal wall, outlined in the primary incision, is dissected free and removed with the cervix.

As indicated in Fig. 6, Douglas's culdesac is occasionally accidentally opened while the mucosa of the posterior vaginal wall is being

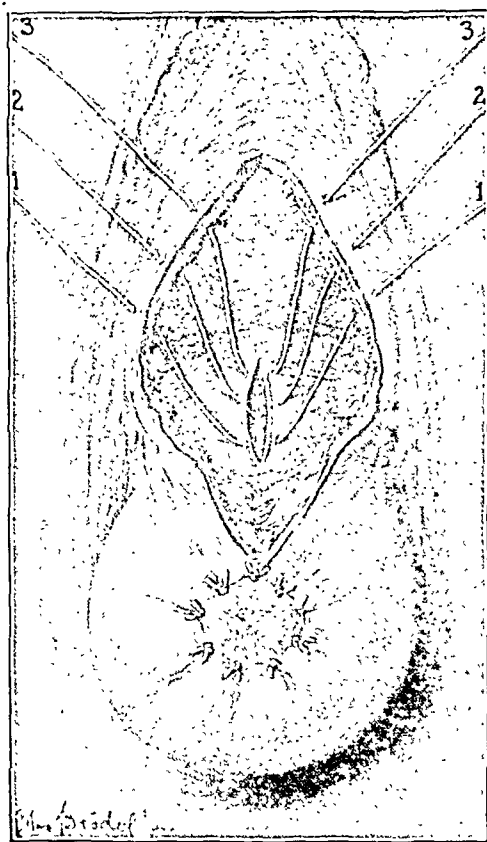


Fig. 8.—The vaginal mucosa has been attached to the cervix all the way around. The fixation sutures 1, 2, and 3 are now snugly tied and the intervening spaces approximated by a continuous suture.

The cervix was purposely left outside in order that the various steps can be clearly seen. At this point in the operation the cervix is actually well within the vagina.

dissected free. When this happens the opening is closed with fine continuous catgut, care being taken in the meantime to prevent any blood from escaping from the vagina into the peritoneal cavity.

The vaginal edges are now united to the cervix, as shown in Fig. 7. Figure-of-eight sutures here enable us to secure snug approximation with half the number of knots that would be necessary were interrupted sutures employed.

After the vagina has been sutured to the cervix, we have the picture shown in Fig. 8. The fixation sutures are now tied, giving us the picture shown in Fig. 9. As a rule, there is not an accurate approximation above and below sutures 3 and 1, and there is often slight gaping between sutures. To remedy this a continuous suture is used.

The perineum is now repaired.

The operation as shown above has given us excellent results and I know of no other plastic procedure in gynecology that is so univer-

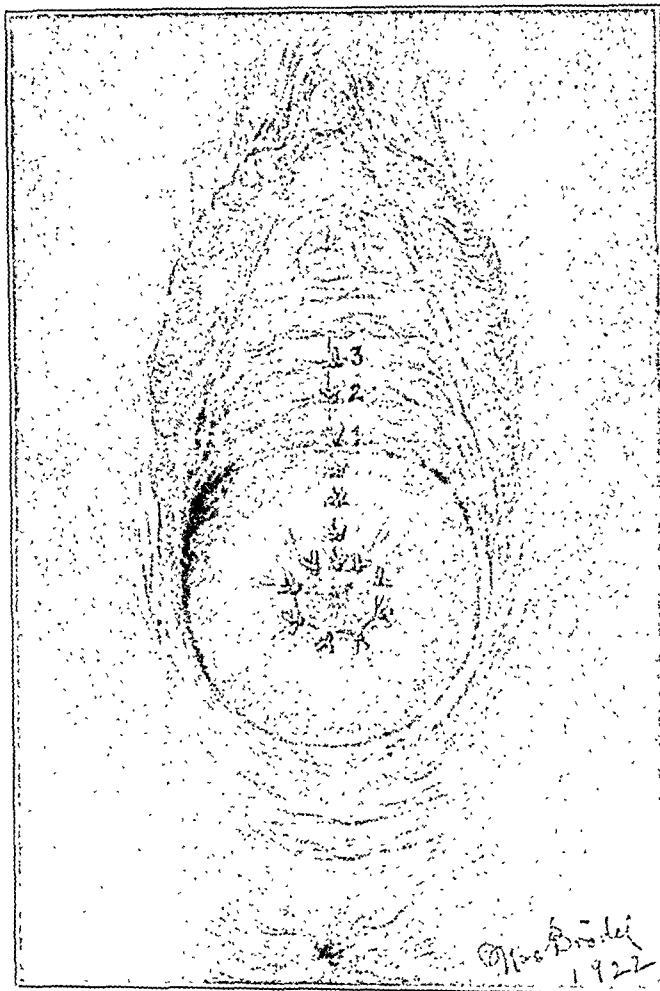


Fig. 9.—The cervix actually lies farther in than this. The perineum is now repaired and the operation is finished.  
A catheter introduced into the bladder will show that it is now well lifted up. It rests on the fundus of the uterus.

sally satisfactory. I have been using the traction sutures for years. In a few cases in which the uterus has been exceptionally friable they have occasionally pulled out and it was necessary to introduce others. On the whole they are much more satisfactory than the tenaculum or mesoforceps. When we no longer need these sutures as tractors, they become the permanent fixation sutures.

## PRE-CANCEROUS CONDITIONS OF THE CERVIX UTERI\*

By R. R. HUGGINS, M.D., PITTSBURGH, PA.

WHEN one considers that an individual born today is entitled to live ten years longer than one born fifty years ago, we must realize how rapidly our methods of treatment are changing and will continue to change in the years to come. In a short time the offices of physicians will be filled with people who come to consult them with reference to the state of their health rather than wait until sick. They will want to know if they are up to their own normal and if their resistance is such that they will be able to withstand the invasion of infecting organisms and the strain incident to the stress of life. In other words, we have entered the stage of prevention and it marks a new era in the progress of scientific medicine. The subject and contents of this paper are so elementary that it seems like wasted energy, were it not somewhat doubtful that enough is said about the prevention of cancer of the cervix. It would seem that it is the duty of the members of this organization to teach more actively both the public and physician what they know about the prevention rather than continue to stress the symptoms. While the early symptoms are important, yet how seldom are we consulted at the time when the patient can be saved by any known method of treatment. In teaching prevention, we will educate the public to the necessity for heeding the early signs.

One of the most gratifying things in medicine is the wonderful progress made during the last twenty-five years in the prevention of disease and reduction of mortality. It is rather remarkable that while there is a steady reduction in the mortality of tuberculosis, there has been a corresponding increase in cancer. The reduction in the mortality of tuberculosis and many other diseases had been due largely to preventive measures and to a more intelligent appreciation by both the public and the profession of the underlying causes. Because no definite cause has been assigned to cancer and because of its frightful mortality, we have been somewhat slow as a profession in asking the public to share with us the responsibility of more active measures in its prevention. We hesitate to mention the word cancer to our patients for it carries terror equal to that of the electric chair. It would seem that the time has arrived that we should take our patients into our confidence and tell them all we know about this dread disease. Before doing this, however, the profession itself must

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\*Read at the Forty-seventh Annual Meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

appreciate a few important principles in the consideration of this subject.

It seems apparent that in injuries and irritations we have causes which promote the formation of malignant growths, but after all is said, there is a gulf between the cells of normal tissue and the cells of tumors which remains hidden and unexplained. The absence of any explanation should not blind us to the existence of certain clinical facts that are of great importance in a very practical way. Virchow believed that irritation was an important factor in the etiology of cancer, but it remained for Fibiger to produce carcinoma

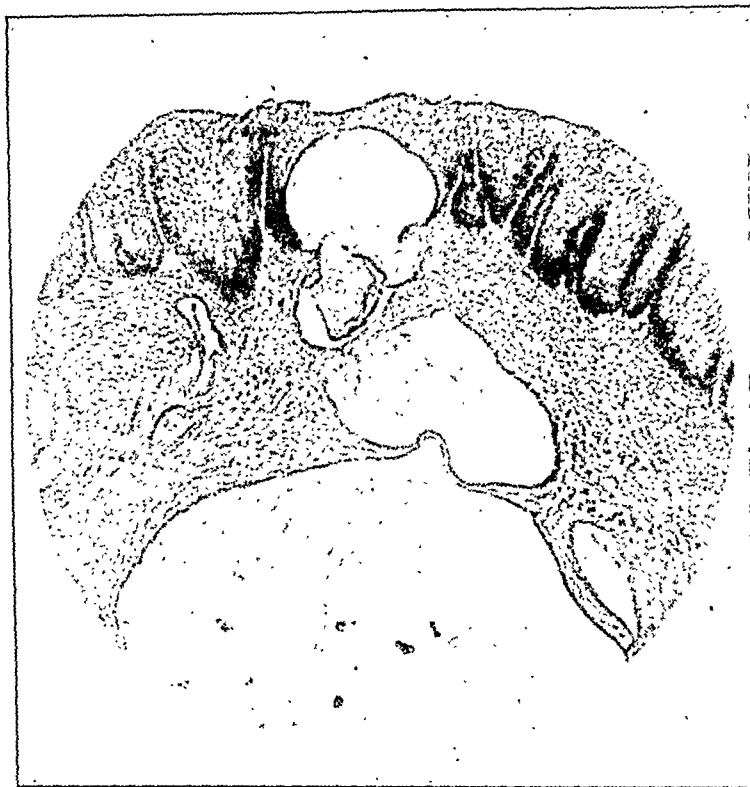


Fig. 1.—P-1699-14. This figure illustrates the effect of the closure of the duct of a cervical gland by an overgrowth of squamous epithelium, the result being a retention cyst or Nabothian follicle. These cysts probably have no direct connection with carcinomatous change but serve as sources of chronic irritation and are associated with chronic cervicitis.

in the stomach and esophagus of rats by infecting them with spiroptera, the cause of the malignant change being irritation of the mucous membrane by the parasite. Yamagiwa after several years of experimental work on this subject concluded "that repetition or continuation of chronic irritation may cause a precancerous alteration in epithelium previously normal; if the irritation continues its action, carcinoma may be the outcome even though no specific agent has been interpolated." In a series of experiments carried on over a period of four years by Yamagiwa and Ichikawa in the production of carcinoma, painting with coal tar was found to be most effective. They

were able by repeated applications of coal tar to the ear of rabbits over a period of from thirty to three hundred and sixty days to produce new growths, which under the microscope showed carcinoma in its earliest stage. Certain of the growths continued to increase in dimension until they imitated even macroscopically the carcinomata of man. Cases of metastasis were demonstrated. They were able to produce eight cases of carcinoma in its earliest stage, sixteen in an early stage and seven complete carcinoma. The carcinomatous change was discovered between the fifty-fifth and three hundred and sixtieth day. In most cases it was found after the one hundred and

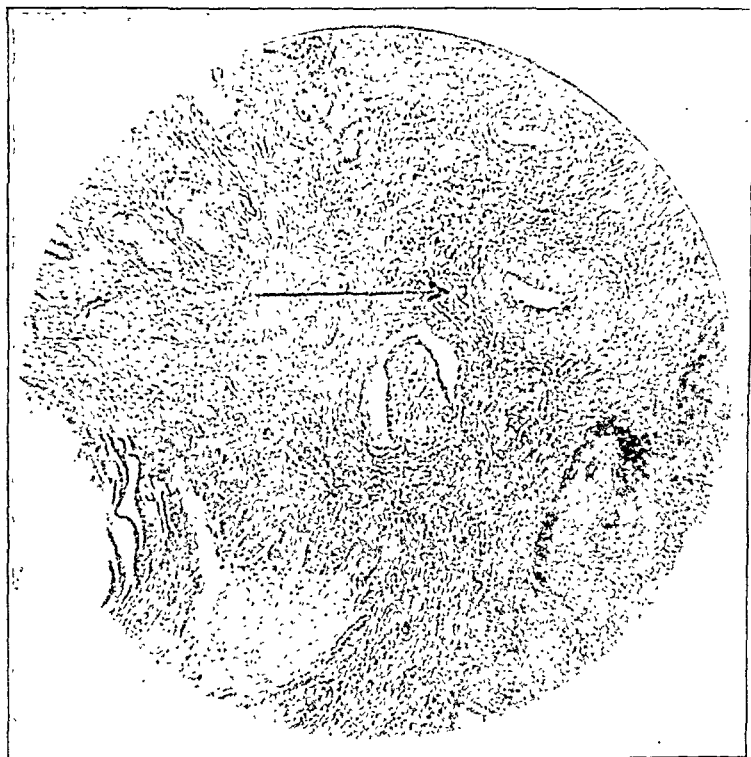


Fig. 2.—P-1699-14. The arrow in this figure points to a cervical gland which is lined with squamous epithelium instead of the normal columnar type. The gland probably ruptured and became relined by an extension from the surface epithelium. Bits of epithelium cut off in this way have been shown to be more or less directly associated with carcinomatous changes and are similar to the epithelial displacements in the pylorus of the stomach on which so much stress has been placed at the Mayo clinic. Other retention cysts with acute inflammatory exudate about them are seen in the section.

fiftieth day. They concluded that the continuation of chronic irritation may cause a precancerous condition in epithelium previously normal.

In general we are concerned with two factors, a predisposing cause and an exciting one. It is evident that the study must begin in the individual living cell and it seems probable that the predisposing cause is a chemical one, because tissue does not react the same to all forms of irritants. This has been proved in the study of occupational cancer. For instance among workers exposed to soot, which

is less irritating when compared to tar, coal dust, gas tar, pitch or blast furnace pitch, we find the greatest cancer incidence. Cancer is more frequent in organs exposed to fluids undergoing bacterial decomposition with its consequent chemical change, such as the stomach, rectum and cervix. The constant bathing of a chronic erosion of the cervix with the accompanying inflammation in a purulent acid secretion must be an important factor in the cause of malignancy. The period of time over which this may occur is especially important and should be given due consideration.

We must acknowledge that we do not know the exact cause of this



Fig. 3.—P-1788-14. This figure illustrates a displacement of squamous epithelium upward into the cervical canal and the extension of the epithelial tissue over the mouth of the gland resulting in cystic distention and chronic inflammation. This epithelial mass, while irregular and thick, is, to all appearances, nonmalignant. Such processes of squamous epithelium which extend upward into the cervical canal represent the opposite of the condition known as the erosion of the cervix which consists in a displacement of columnar epithelium downward onto the external surface.

peculiar change in tissue. We know that for some reason, the growth we call cancer, is a proliferation of cells previously normal, which increase in number until a mass is formed which attracts attention as a result of the changed condition of the normal structures. This does not occur in a day or month, but clinical experience teaches that it is a slow growth and that it probably has its origin in a single cell which has renounced its allegiance to the normal body control. How long the cause may have existed before the onset of malignancy

is unknown. We do not know whether certain systemic changes may predispose, or whether it is entirely local. If we have learned anything about the cause which is in any way helpful, it must be that constant irritation with its attendant inflammation plays a most important part in its development. The fact that it occurs almost always in tissue that is located in the body where there is more or less constant friction or irritation from the normal performance of function seems sufficient proof that this factor plays a most important part. This is sufficiently appreciated by all, so that farther dis-

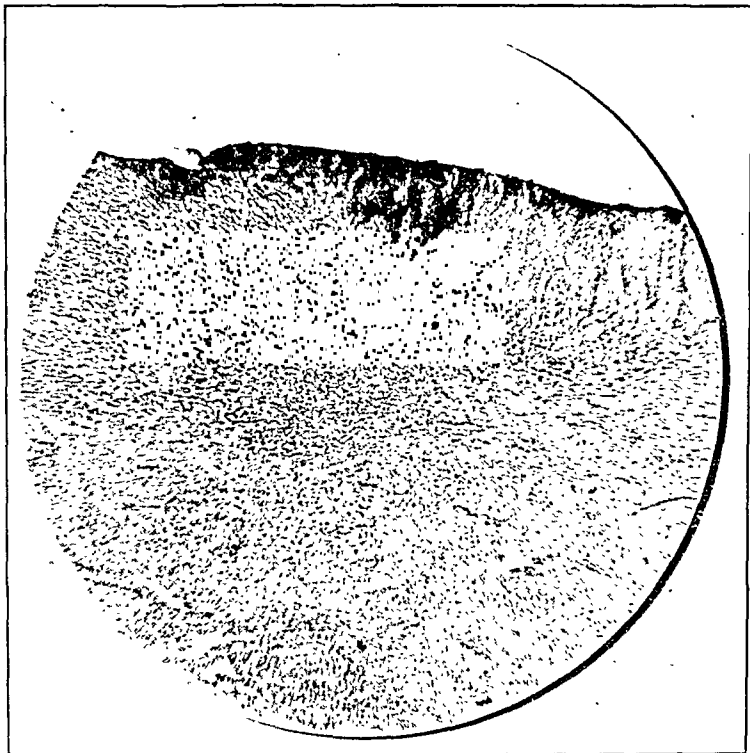


Fig. 4.—S-21-736. This figure illustrates the overproduction of squamous epithelium which has taken place in the repair of an actual cervical ulcer. There is no definite basement membrane present. The epithelial tissues have extended for a distance of two or three times further into the stroma of the cervix than happens under normal conditions, and present a ragged and irregular border. The cells are more or less atypical and the condition is definitely a precancerous one.

cussion upon this point is unnecessary. We can seldom anticipate when the cells may rebel, and a mutiny ensue with the result of malignant change but, if on the alert, we can see that the patient's general health is up to the normal and that all points subject to local irritation are kept free from inflammatory change. If this is true in other organs, then it must be equally true in the cervix. Our results so far as treatment is concerned in cancer of the cervix are very poor. Unless discovered and operated upon very early in the course of the disease the outlook is grave, and even then the operation

is accompanied by a considerable primary mortality, if radically performed. We may continue to emphasize the necessity for early diagnosis, but unless we are able in some way to prevent or anticipate the diseased change, we will be usually too late. It is true that many women do not consult a physician until the disease is well advanced, but practitioners are very slow in the serious consideration of symptoms almost pathognomonic of cancer of the uterus.

Just as we remove warts or moles or pull a tooth with sharp edges or excise an ulcer of the stomach to prevent the development of cancer, so we must learn to treat the cervix in all women approach-



Fig. 5.—P-80-12. This figure shows the point of change between the stratified squamous epithelium and the columnar epithelium of the cervix. In this instance the squamous epithelium has undergone an atypical hyperplasia, is penetrating deeply into the stroma, is free from basement membrane and shows definite early malignancy. It is associated with chronic endocervicitis and hyperplastic and cystic cervical glands.

ing the age of forty. This is true, of course, more especially of the woman who has borne children. It is remarkable how seldom we find a healthy cervix in women who have given birth to one or more children. There is always chronic inflammation present where there is erosion and cyst formation incident to this process. It is quite likely that scar tissue in old lacerations is of little importance without the inclusion of the above mentioned conditions. So frequently do we find the cervix filled with cysts which are really due to a replacement of the epithelium. If we consider what happens in the healing



of an erosion it is perfectly easy to understand how the cervix becomes filled with these small cysts which cause a certain amount of irritation.

Erosion used to be called an ulcer, that is a loss of tissue, but on the contrary in erosion there is an increase of tissue and the condition should really be described as a sessile adenoma. The vaginal portion of the cervix is normally covered over with many layers of a squamous epithelium continuous with that of the vagina and at or about the os externum the epithelium suddenly becomes cubical and is in fact the columnar glandular epithelium which lines the cervix and the body of the uterus and which consists of a single layer of tall cells.



Fig. 6.—P.124-12. This figure illustrates an early squamous cell carcinoma of the cervix with hyperplasia of the epithelial layer and penetration into the stroma. At several points, epithelial masses are found extending into the lumina of the glands.

These cells are continuous with the glands of the cervix which are numerous and which are also lined with a single layer of columnar epithelium. The glands of the cervix are more complicated and larger than the glands of the uterus. In fact the cervix is itself a gland and is a structure quite apart from the body of the uterus. It is in connection with these glands or at all events with the columnar glandular epithelium lining of the cervical canal that our interest lies in the pathology of erosion. This red patch which is so typical in its appearance is due to an overgrowth and hypertrophy of the columnar cells lining the cervical canal which spread over and grow through the

squamous epithelium which normally covers the vaginal portion of the cervix. This bright red area then is not due to any destruction of tissue but simply to a replacement of deep columnar cells over a wider area than normal. The bright red color is due to the fact that the surface is covered by only a single layer of cells allowing the bright color of the underlying blood vessels to show through. If a return to the normal occurs it comes from a recovering of this surface by the normal squamous cells of the vaginal mucous membrane. When this happens these deep cells, glandular in type, become buried and covered over. Their natural function being to secrete, it is easy to



Fig. 7.—P-2359-15. This figure illustrates an adenomatous polyp of the cervix associated with severe chronic inflammation. There is no evidence of malignancy in this section, but the rather rare condition of adenocarcinoma of the cervix occasionally starts in this type of growth.

account for the formation of cysts. Masses of these little mucous cysts may occupy the surface of an erosion or extend deeply into the tissue of the cervix. The marked tenderness so often present in this condition indicates the presence of inflammatory change.

The presence of these cysts scattered throughout the cervix is common and the extent is often not appreciated until amputation or incision reveals their presence.

Every woman who has borne children and who has reached the age of forty should be examined and if disease of the cervix is found it should be treated. This treatment may be palliative but often it

should consist in the removal of the diseased tissue. We must remember that cancer starts in a small way, perhaps in one single cell. That while a cervix may present but slight evidence of disease, this may be sufficient in the presence of susceptibility and an acid medium to cause cancer. It is important that every practitioner acquaint himself with what a normal cervix is, so that he may appreciate the deviations from the normal and cure the cancer before it starts, because there is no doubt that this is our only means of dealing with this horrible disease at the present time.

Sixteen years ago I read a paper on this subject and reported four cases where cancer of the cervix developed in patients who had been under my care before its onset, and where previous examination had been made showing marked pathologic change in the tissues of the cervix, chronic in character, which undoubtedly predisposed to and preceded the malignant change. There has been no change in our ideas and all the evidence which has accumulated points to the following facts which were enumerated at that time.

First: That the cancer begins as a benign growth.

Second: That there is a true precancerous stage in which removal is a sure means of relief.

Third: That the disease is absolutely local in its beginning.

Fourth: That there is a varying degree of malignancy, some growths tending to return more readily than others.

Fifth: That as a rule tissues are more susceptible to its development at the age where atrophy and degeneration take the place of the building-up processes.

Sixth: That it is prone to develop in an acid medium such as the stomach or vagina.

I desire to acknowledge my appreciation to Dr. S. R. Haythorn and Dr. H. H. Permar for their help in preparation of the illustrations.

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# Society Transactions

## AMERICAN GYNECOLOGICAL SOCIETY

FORTY-SEVENTH ANNUAL MEETING

WASHINGTON, D. C., MAY 1, 2, 3, 1922

*(Continued from October issue.)*

DR. JOHN A. SAMPSON, of Albany, N. Y., read a paper entitled **The Life History of Ovarian Hematomas of Endometrial Type.** (For original article see page 451.)

### DISCUSSION

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MARYLAND.—Dr. Sampson has done a great service in showing us three things. First, the origin of ovarian hematomata which, in the past, has been a great conundrum. Second, he has demonstrated the mechanism by which certain adenomyomata of the structures posterior to the uterus may develop. Third, he has proved the possibility of the transplantation of tubal and uterine epithelium upon other parts of the body and its subsequent growth.

I think no one who has seen these specimens can have any doubt about the nature of the ovarian hematomata which have been demonstrated to us. On the other hand, I do not feel that the arguments presented concerning the implantation of tubal and uterine epithelium are quite so convincing. But when I saw all of these specimens and talked with Dr. Jacobson I was convinced, so that I do not hesitate to tell you that I believe that everything Dr. Sampson has said is entirely justified. Dr. Jacobson experimented with rabbits, and after incising one horn of the biocornuate uterus, scraped off a little mucosa and imbedded it beneath the peritoneum in various parts of the body. Upon opening the animals weeks or months later he found small cysts at the site of implantation, some having the distinctive features of tubal, and others those of endometrial cysts. In other words, he was able to produce experimentally exactly the same condition that Dr. Sampson has shown us. Accordingly, I believe that the combination of Dr. Sampson's clinical observations with Dr. Jacobson's experimental work clinch the matter, so that I have no hesitation in endorsing everything Dr. Sampson has said, and I congratulate him on his splendid work, and the Society on having so enthusiastic a member, who is capable of conducting such investigation.

DR. JOHN G. CLARK, PHILADELPHIA.—Since Dr. Sampson brought out his paper last year we have been on the alert and have discovered three or four such cases as he has reported. This discovery of Dr. Sampson opens our eyes as to its possible relationship to the origin of adenocarcinoma of the ovary. The etiologic deductions are also of interest and I cannot but wonder if this misplacement of epithelium may have any bearing upon the etiology of the adenoecystomata of the ovary. As to my personal observations I have held that these large cysts originate from inclusions of the glandular structures of the wolffian body. Certainly through

his painstaking search for new truths, Dr. Sampson has added a valuable discovery to the list of pathologic lesions of the generative organs.

DR. CURTIS F. BURNAM, BALTIMORE, MARYLAND.—Dr. Thomas S. Cullen has asked me to report three cases of adenomyoma of the abdominal incision. One of these cases followed an extensive operation for adenomyomatous uterus and adenomyoma of the rectovaginal septum eight years after the original operation. The other two cases followed ordinary cesarean sections, one of them belonging to Dr. Albert L. Stavely, of Washington and one to Dr. Ernest A. Codman, of Boston. The first case shows that it is possible to transplant adenomyoma; the other two indicate that ordinary uterine mucosa implanted into an abdominal incision can grow into a tumor exactly like adenomyoma. I may mention that all of these cases have been histologically studied and all are typical adenomyomata.

I have been much interested in what Dr. Sampson has said and in the comments of Dr. J. Whitridge Williams, because I remember two years ago talking with Dr. Sampson when his work was comparatively new. I did not see his specimens then and I will have to see them before I am convinced that the blood cyst of the ovary is analogous to or the same condition as adenomyoma of the uterus. We must remember that the surface epithelium of the ovary is ciliated and that it is quite possible for ciliated epithelium to grow down into the lutein or blood cyst after rupture. The cells which Dr. Sampson speaks of as endothelial phagocytes are very similar to the cells which we have spoken of as external theca or lutein cells.

DR. BENJAMIN P. WATSON, TORONTO, CANADA.—I would like to ask Dr. Sampson with reference to the stroma surrounding the glandular structures which he finds in the ovaries and other places. Since Dr. Sampson's first communication we have tried to investigate all ovaries containing hematomata, and our difficulty has been that while occasionally we found glandular epithelial structures, we have never been able to satisfy ourselves with regard to the stroma surrounding these glands, and it seems to me, the stroma is the essential part of this theory. We do not have menstrual bleeding except in the stroma, and this cannot arise from epithelial implants. Does Dr. Sampson believe that the stroma can be derived from these epithelial implants, and if not, how does that stroma, which will allow of menstrual bleeding, come about in this situation? That to my mind is the difficulty in accepting epithelial mechanical implantation occurring after middle life as an explanation of these conditions.

DR. WILLIAM C. DANFORTH, EVANSTON, ILLINOIS.—I would like to ask Dr. Sampson whether these cases can be dealt with in any other way than by total removal.

DR. SAMPSON (closing).—As I understand Dr. Clark's question it is this: When small implantations are found on the ovaries at operation, what shall be our treatment of this condition? My reaction at the present time is to be conservative of ovarian tissue, excising these areas without removing the ovaries if ovarian conservatism is desired. In cases with a hemorrhagic cyst and perforation, both primary implantation adenomas from the tubes and secondary ones arising from epithelium escaping from the perforated ovarian cyst, may be present. If extensive implantations are found I believe that all ovarian tissue should be removed.

Three of the cases in which I have done conservative ovarian resection, were not relieved by the operation. In one of these I operated a second time and found that the implantation adenoma had increased in size. Conservative ovarian surgery is a dangerous experiment in cases in which there is extensive implantation.

Dr. Watson asked about the origin of the stroma about the glands in these aden-

omas. In undertaking this work the first thing I tried to do was to obtain a knowledge of the uterine and tubal mucosa under different conditions. I have accepted as my standard of comparison the glandular elements found in primary adenomyoma of the tube and of the uterus, because we appreciate the fact that these growths have arisen from the invasion of the walls of the tubes and the walls of the uterus by the mucosal lining. We usually find in primary adenomyoma of the tube that the stroma so characteristic of the endometrium, is either absent or scanty. We will also find, if we study the cases of primary adenomyoma of the uterus, that as the growth begins to invade the uterine wall, glands without stroma may invade the uterine wall first and subsequently that stroma is developed. Furthermore, in the study of implantation adenomyomas of endometrial type the growth on the surface may not be accompanied by stroma, but after it invades the tissues of the organs beneath it the characteristic stroma of the endometrium develops around the glands and tubules. This would suggest that the stroma in these cases is derived from the tissue invaded and is not carried with the epithelium. One of the most convincing arguments in considering that these adenomas on the surface of the ovary are acquired and not congenital, is the fact that we find small (primary) implantations of apparently the same age and structure not only on the surface of the ovary but also on the peritoneal surface of the pelvis. Furthermore, they are most frequently found on the structures which come in contact with the fimbriated end of the tube.

In answer to the question of Dr. Danforth, my tendency is to be conservative from an operative standpoint in the cases of young women unless the growth is extensive. The majority of the cases of implantation adenomas are only of histologic and pathologic interest. Sometimes they acquire great clinical importance when they combine invasion (malignancy) with that of function because the menstrual activity gives rise to the most distressing symptoms.

DR. WATSON.—I would like to ask Dr. Sampson how he explains the hemorrhage in those cases of small tubes where there is no stroma. I have seen it present in some specimens apparently nontypical of endometrial stroma.

DR. SAMPSON.—We have found in most of these cases a little bit of stroma. I look upon the presence of the stroma not as absolutely necessary, but of importance in the development of the hemorrhage.

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PROFESSOR W. L. WILLIAMS, of Cornell University, by invitation, read a paper entitled **Some Phases of Bovine Genital Infections of Possible Interest to the Medical Profession.** (For original article see page 513.)

#### DISCUSSION.

DR. N. SPROAT HEANEY, CHICAGO, ILLINOIS.—Dr. Williams' experience as an obstetrician and gynecologist in veterinary medicine is much more extensive than the experience of any one of us here. His patients number thousands, while ours number hundreds. Dr. Williams is able to come to definite conclusions regarding the problems in which he may become interested. If he were to become interested in a subject such as Dr. Peterson spoke about last night, "Tuberculosis of the Genitalia," he could go to the slaughter house and by examination of the material at his disposal, find out what percentage of apparently healthy animals have tuberculosis of the pelvic organs. Or he could go to the slaughter house where known tuberculous

animals are butchered and find out what ratio exists in animals known to have tuberculosis between the lesions in the pelvis and those in the lungs.

Unfortunately, cows do not have cancer of the uterus or malignant tumors of the pelvic organs, so they are not suited to a very extensive study of malignancy. However, cows do have extensive inflammatory changes in the pelvis. Sterility in cattle will teach us much regarding our problems of sterility in the human family. Their period of gestation is similar and many interesting analogues may be found.

The value of cooperation between the biochemist and the clinician was mentioned a number of times. If, in our medical schools, we had a veterinary department, it would undoubtedly be very valuable. For instance, a veterinarian might tell us what animals are particularly suited to the particular problems we wish to study and would hardly recommend the gestation period of guinea pigs as being very helpful in the study of problems of gestation in the human family. The veterinarian is very exact in his information. During a pelvic examination, for instance, he can tell the difference between a corpus luteum and a graafian follicle. He can also tell from this examination just when the animal will again be in heat.

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MARYLAND.—I want to acknowledge to Dr. Williams my debt of personal gratitude for the two books he has written. A number of years ago he wrote his book on veterinary obstetrics, and when I bought it I read it from cover to cover, and last year, when he gave me a copy of his last book I read it with such extreme interest that I volunteered to write a review of it. In that review I stated that his work and that of many veterinarians was a revelation to me, and that they were doing many things which human gynecologists and obstetricians could but do not do, and they were obtaining a degree of precision in many things that we lacked.

I could relate many features of veterinary obstetrics because they have interested me profoundly. My original interest was aroused by studying the placenta of the cow, in preparation for a course on comparative placentation. Since that time I have been particularly interested in another disease which Dr. Williams did not mention in his paper, but which is of extreme interest, namely, parturient paresis. As you know, the disease nearly always affects a perfectly good cow, who, shortly after she has a calf, lies down, sticks out her hind legs, is unable to get up and passes into a condition of coma and dies, with albumin and sugar in the urine. In recent years a method of treatment has been introduced for this disease which cures them all, and consists in squirting air into the udder by means of a bicycle pump and in a few hours the cow gets up and walks away cured. The treatment is so universally successful that only occasionally a cow dies, and for several years I have had veterinarian friends looking for cows who had died of the disease so that I could get autopsies. I have not yet succeeded.

Cattle present extraordinarily interesting problems. For instance, Dr. Williams could tell you about the venereal diseases in cattle and it would surprise most of you to know that practically every cow suffers from them.

DR. WILLIAMS (closing).—I do not think I have anything to add except to express my appreciation for the attention and interest which my paper has elicited, and to voice my belief in the value of the recognition of veterinary and human medicine as one science. I hope that in their purely scientific aspects they will become more and more unified as time goes on.

DR. EDMUND B. PIPER, of Philadelphia, Pa., by invitation, read a paper entitled **The Treatment of Puerperal Sepsis with a Report of Animal Experimentation in the Chemical Disinfection of the Blood by the Use of Mercurochrome.** (For original article see page 532.)

#### DISCUSSION

DR. BARTON COOKE HIRST, PHILADELPHIA, PENNSYLVANIA.—One of the most disappointing things in modern medicine is our failure to make progress in the treatment of blood infections by septic microorganisms. Other scourges of mankind are more amenable to treatment than they were forty years ago. I sent recently a questionnaire to the chief centers of the country and was amazed at the lack of initiative shown by the replies, in this work. Dr. Polak alone had something to suggest. He advocated repeated transfusions of small quantities of blood. In none of the other centers was anything being done to advance our knowledge of the treatment of puerperal sepsis. Dr. Piper's work shows at least an attempt to improve our means to deal with the problem. It is creditable clinical study with hopeful results, and a very pretty piece of laboratory work. I have observed the treatment of puerperal sepsis for a long time, with unusual opportunities because I believe the maternity of the University of Pennsylvania is one of the few places in the United States which solicits these septic cases from the outside for study. What is also important, my state of mind has been skeptical in watching these new propositions because I have had so many disappointments, but after a careful observation of Dr. Piper's clinical application of his experimental work, I am convinced that this form of chemical disinfection of the blood must have a place in the future treatment of blood infections by septic microorganisms. Dr. Piper could not give the details of the cases in which this treatment was successful, but I had the opportunity to study these patients from day to day, and I am convinced that with this form of chemical disinfection of the blood we can effect temporary improvement at least, allowing time for the ultimate establishment of immunity. For example, in a blood giving numerous colonies in culture experiments in twenty-four hours, it would take five days after one of these treatments to get a positive blood culture with but few colonies. Coincidentally the patient would be distinctly better and so on until immunity was established. Some of these cases would, I believe, have died without this aid.

My conviction is that we have in this method of chemical disinfection of the blood a valuable aid in the treatment of blood infections by septic microorganisms. It is, therefore, incumbent on us, I think, to give these patients the benefit of this treatment if we are to render them every aid possible; not as a specific, but in addition to fresh antistreptococcic serum, demonstrated in my clinic to have distinct, and sometimes brilliant results, and to all the other methods of treatment that have been shown to have some efficacy.

DR. BROOKE M. ANSPACH, PHILADELPHIA, PA.—I have been much interested in these experiments of Dr. Piper, having known of them from the beginning, and especially so in view of the work which was presented before this Society at the last meeting in Philadelphia by Chalfant and Miller, of Pittsburgh, relative to the use of arsenobenzol in hemolytic streptococcus blood stream infections. At that time in the discussion of the paper, Dr. Hare, of Philadelphia, pointed out that no experiments had yet proved that arsenobenzol would kill the spirochete pallidum in a test tube, and that Ehrlich himself had realized there was some reaction after the introduction of arsenobenzol into the blood stream which actually destroyed the germ of syphilis. He further went on to say, that whereas the spirochete belongs



to the animal kingdom, hemolytic streptococci belong to the vegetable kingdom, and Ehrlich did not claim any effect upon the latter. Hare suggested laboratory experiments to clear up these questions. Whether such have been made by others or not, I do not know, but if I understand him correctly, Dr. Piper has shown that mercurochrome can kill, or seriously impair the activity of the streptococcus hemolyticus when suspended with it in blood serum.

I think there is a distinct promise in the work of Dr. Piper of an addition to our therapy in combating these severe infections. The mere fact that the use of a chemical alone has not cured the patient is no argument against its efficiency in one direction at least. Is it not likely, in these severe blood stream infections, that although we may destroy the streptococcus with a germicide, we do not get rid of the toxin, and that is probably what kills the patient?

I have been told by men who direct the preparation of the sera in one of the large and well-known manufacturing companies of the country, that the results from the use of sera in artificially produced infections were amazing. Some time we will be able to do the same thing with the human subject. May it not be hoped that by this combination of the use of antiseptics, such as mercurochrome, to kill the bacteria, and the injection of antistreptococcic serum or other sera to neutralize the toxins, a definite improvement in our therapy may be effected?

DR. JOHN A. MCGLINN, PHILADELPHIA.—Piper's study takes us back to the time when formalin was employed in this type of case. Practically everything in the disinfectant line has been injected into the blood stream with the hope of curing these cases of blood infection. Perhaps Dr. Piper's assumption that it forms an autogenous vaccine by cutting off the bacteria is not so far fetched. It is not so much the antiseptic action of the bacteria in the blood stream as it is that a foreign protein is thrown into the blood stream. Cases of pneumonia have been treated by Dr. Fred B. Robertson by the use of paratyphoid injections given intravenously. Recently we have been using foreign proteins, such as milk, in pelvic infections, particularly a generalized infection, and the results are amazing. Patients have a severe reaction, the temperature ranging from 104° F. to 105° F., then dropping to subnormal. In one case a large pelvic mass entirely disappeared, the fixed uterus became freely movable, and after the second injection the mass disappeared and the pelvis was absolutely normal. It is more than a blood infection. The organisms are distributed by the blood, but there are foci in various parts of the body, and they are hard to get rid of in the short length of time the germicide remains in the system.

DR. ARTHUR H. CURTIS, CHICAGO.—We have gone through the milk and other foreign protein stage, and have not noticed a distinct change. I do not think the remarks that have been made should go into the proceedings without objection; foreign proteins appear to be momentarily helpful, but are evidently of no permanent value.

DR. PIPER (closing).—It is due to the kindness and consideration of Dr. Hirst that I have had placed at my disposal clinical material for what small amount of clinical work there has been done. There have been times during the past two years, when I have seriously considered dropping the whole matter. This has been due to the negative results that we got for a time owing to faulty technic.

I want to thank Dr. Anspach for his remarks and especially for what he said about arsenobenzol. Although we have not had any results from this drug, we do not mean to say that others may not. We do not know that the streptococcus is killed, but these patients definitely become clinically better. That is the only positive statement that can be made. The negative blood culture may or may not mean that the organisms have been destroyed.

Dr. McGlinn has called attention to the various attempts in years past with chemical disinfectants. The tests done with bichloride of mercury and formic aldehyde are probably the two best known examples. When bichloride of mercury was used, 30 minims of a 1:10,000 solution were given intravenously. We are using from 25-50 c.c. of a 1 per cent solution of mercurochrome, approximately 1,500 times stronger. Our effort has been to produce within the blood stream a dilution of sufficient strength to be germicidal to the streptococcus without being toxic to the individual.

It must be remembered that in all of these cases there is more than blood stream infection alone. We have no idea that we are presenting a cure-all. So far as the actual sterilization of the blood is concerned, no one feels the hopelessness of it more than I. Perhaps, the blood may be sterilized temporarily, but the original focus may keep pouring out fresh organisms into the blood stream. Our hope is, that we may sterilize the blood stream temporarily, and by repeated sterilization, if such a thing is possible, we may aid the human organism to gradually increase its resistance up to the point where it is able to throw off and conquer the infection itself.

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DR. THOMAS S. CULLEN, of Baltimore, Md., read a paper entitled **A Point in the Technic of Vaginal Fixation of the Uterus**. (For original article see page 544.)

#### DISCUSSION

DR. J. RIDDLE GOFFE, NEW YORK CITY.—I had the privilege of seeing Dr. Cullen, in doing the interposition operation, apply the point of technic which he has just described. I was surprised at the difficulty he experienced in delivering the fundus of the uterus into the vagina preparatory to inserting the stitches which were to secure the fundus between the bladder and the vagina. It was a case of procidentia and the pelvic organs were easily reached through the vaginal incisions.

Later, I discovered, that after amputating the cervix and before attempting to deliver the fundus, he had attached a heavy traction forceps to the cervix, which held it at the vulva. This revealed the mystery, viz: the presence of the difficulty his procedure was designed to overcome; in order to have both poles of the uterus at the vulva at the same time it was necessary to flex the fundus extremely on the cervix, and this the uterus was not long enough to permit. I am sure the difficulty can be avoided if, in the process of delivering the fundus, he at the same time pushes back the cervix into the vaginal culdesac, instead of holding it at the vulva.

DR. THOMAS J. WATKINS, CHICAGO.—The tension sutures, illustrated by Dr. Cullen for delivery of the body of the uterus and for fascia fixation, it seems to me, will prove to be very serviceable. Any one who has done many of the transposition operations must have been impressed with the fact that in occasional cases the delivery of the body of the uterus is rather difficult, and that consecutive passage of the suture through the body and cervix of the uterus is also difficult in some cases. Dr. Cullen's sutures solve these difficulties.

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DR. R. R. HUGGINS, Pittsburgh, Pa., read a paper entitled **Pre-Cancerous Lesions of the Cervix**. (For original article see page 552.)

(To be continued.)

# Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

## Collective Review

### Lumbar Puncture in the Treatment of Eclampsia

BY RAMSAY SPILLMAN, M.D., WASHINGTON, D. C.

THIS review is not a brief either for or against lumbar puncture in eclampsia. It is an attempt to find, in the literature, an answer to the question, "What happens when a lumbar puncture is done in eclampsia?"

The first to publish an account of the use of this therapeutic measure in this condition appears to have been T. A. Helme,<sup>9</sup> whose description of one case appeared in the *British Medical Journal*, May 14, 1904, four and one-half months before the appearance of Krönig's more extended observations<sup>12</sup> in Germany. Helme suggested "that the eclampsia is due to increased cerebrospinal tension" and was so gratified by the result of the puncture that he lamented having refrained from using it in a previous case presenting a similar clinical picture, which went on to a fatal ending. Similarly, Snyder<sup>17</sup> performed a lumbar puncture on an eclamptic patient who was in extremis, and the patient promptly took a turn for the better and recovered. However, such brilliant results are unfortunately not typical.

For this review, seventy cases have been analyzed and tabulated in a search for the answer to the following questions:

1. Is lumbar puncture a rational procedure?
2. Does it jeopardize the patient's chances of recovery?
3. Does it add to the patient's chances of recovery?
4. How much fluid is there precedent for withdrawing?
5. What is the prognostic significance of bloody fluid?

1. Helme's suggestion as to the rationale of the treatment was supported by the contemporary observations of Krönig and by many others since. Krönig accepted as the normal intraspinal pressure, 120 mm. of water (note: 13.5 mm. of water is equivalent to 1 mm. of mercury). The accompanying charts show pressures in eclampsia ranging from 120 mm. of water to 600.

Martin Fischer<sup>24</sup> in this country and Zangemeister<sup>23</sup> in Germany hold that the convulsions are due to edema of the brain. At all events, edema of the brain has been demonstrated repeatedly at autopsies on patients dying from eclampsia, and the amounts of spinal fluid withdrawn at lumbar puncture (see chart), together with the increased pressure, are in keeping with this condition. It is not the province of the present writer to express an opinion as to Fischer's work. It has been attacked

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by able men. Fischer's conception that the edema is not the result of nephritis but a concomitant of it, and his treatment of edema by the administration of salt and alkali are as far removed from medical orthodoxy as Martin Luther's pronouncement was from theological; but the results that Fischer reports demand consideration. "Edema and Nephritis" is a book which should be read before one either adopts or condemns Fischer's teachings. It may or may not lead one to conclude that there is a better way to reduce cerebral edema than by lumbar puncture, and renal glaucoma than by decapsulation.

2. Does lumbar puncture jeopardize the patient's chances of recovery? Cassagnes<sup>6</sup> concluded, from his collection of reports of fifty-five cases, that it is harmless. However, it should be borne in mind that there are two dangers from lumbar puncture: immediate and mechanical, and remote and infectious. Dandy<sup>25</sup> has recently said of lumbar puncture in brain tumor, "It has no useful purpose, but is accompanied by danger. I have seen at least four deaths following lumbar puncture, and many other patients have had distressing symptoms for many days. The danger lies in the sudden entrance of portions of the cerebellar lobes into the foramen magnum when the spinal fluid is released; the herniated cerebellum, being caught in the bony ring, compresses the medulla and upper spinal cord. Were there any benefits to be gained commensurate with the risk which is always present, lumbar punctures might be sanctioned." That the same dangers do not attend lumbar puncture in eclampsia, the present writer is not willing to assert. As for the remote danger, Weed, Wegeforth, Ayer, and Felton<sup>26</sup> have shown that lumbar puncture in the presence of an infection of the blood-stream invites meningeal infection, and one may or may not be certain that the blood-stream is free from infection at the time of puncture. Such a complication, of course, is a remote one in both senses of the word, but it is to be kept in mind.

3. Does lumbar puncture add to the patient's chances of recovery? In a few of the reported cases the prompt turn for the better certainly suggests cause and effect. Yet in one of Henkel's cases<sup>10</sup> a dry tap was followed by cessation of convulsions. One may add up the number of convulsions shown in the accompanying chart and note that 66 patients had more than 513 convulsions, an average of eight, before the puncture, and 508 convulsions after puncture, an average of eight. But I know of no way of telling how many convulsions these patients would have had without the puncture, and can only conclude that the average number of convulsions was 16, while DeLee in his text gives the average number as from five to 15. Of 68 patients treated by puncture, 19 died, a mortality of 27.6. The footnotes on the chart would indicate that in at least nine of these cases no treatment would have saved the patient, while a tenth died after 265 convulsions—though Spalding<sup>22</sup> has collected reports of 17 cases and adds one of his own, which had 70 or more convulsions, with recovery after 207, 265, and 500 convulsions, respectively. The maximum number he found was 593; this patient died.

In 25 cases out of 68, lumbar puncture was followed by complete cessation of the convulsions; yet in two of these cases there was a dry tap, which makes it questionable whether the canal was entered at all. Of these 25 patients, four died. Three deaths were due respectively to

streptococcus septicemia (this was a case with dry tap), pneumonia, and intraventricular hemorrhage.

4. As much as 101 c.c. of fluid have been withdrawn at one time, with recovery. From 20 to 30 c.c. is the amount that has most often been withdrawn, in the accompanying reports.

5. Prognostic significance of blood in the spinal fluid: Bar<sup>2</sup> found blood in the fluid and at autopsy found a large clot in the right lateral ventricle of the brain, and stated that bloody fluid bespeaks a fatal prognosis. However, in ten cases in this collection there were but four deaths, and in one case, frank hemiplegia with recovery, the fluid was bloody for three successive taps and clear on the fourth.

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## Selected Abstracts

### Pain Relief in Labor

**Hill**: Anesthesia in Obstetrics: The Ohio State Medical Journal, 1921, xvii, 228.

The author decries the fads in obstetrical anesthesia with their misleading claims for painless labor. He believes, however, that labor can be made comfortable by the proper use of anesthetics compatible with perfect safety to both mother and child.

The selection of the anesthetic should be determined by the individual case. The anesthetic best adapted to the type of labor and circumstances with which the accoucheur has to deal, should be the one of choice. Two general methods of pain relief are mentioned: (1) General anesthesia, for which ether or nitrous-oxide-oxygen are advised; and (2) analgesia or amnesia, for which morphine and scopolamine are used.

The first stage of labor is made comfortable by the use of small doses of scopolamine-morphine given after the pains have become regular. The danger

to the child is slight, provided the drugs are not given late in labor. In a primipara scopolamine-morphine should not be given after the cervix is three-quarters dilated.

The amnesia produced by these drugs during the first stage may be followed by nitrous oxide-oxygen administered with each pain during the early part of the second stage. As labor advances and pains become more severe, ether is advised. At the end of the second stage the patient is completely anesthetized and the head delivered by Ritgen's maneuver.

The author believes that ether may be administered much earlier in labor than is generally supposed. The use of a closed cone method of administration, such as the "Ben Morgan" apparatus, is recommended for this purpose. The use of chloroform is not advocated, having been abandoned by the writer ten years ago.

The routine use of drugs which stimulate uterine contractions postpartum is advised following general anesthesia, as a prophylactic measure against postpartum hemorrhage.

NORMAN F. MILLER.

**Clarke: Anesthesia and Analgesia in Obstetrics.** *Journal of the Kansas Medical Society*, Oct., 1921, xxi, 313.

General observations on anesthesia and analgesia during delivery force the conclusion that women are entitled to relief from pain. Proper drugs help and do no harm. Standardization of methods for individual needs is not possible. The method used must give the greatest relief with the least danger to both mother and child. Hot enemas, bromides and chloral, morphine with scopolamine may be used in the first stage; nitrous oxide and oxygen, ether or chloroform in the second. Best results depend on the psychic control of the patient. The physician should not wait until the last minute to attend his patient.

W. K. FORSTER.

**Haultain: Further Experience of the Conduct of Labor Under "Twilight Sleep."** *Edinburgh Medical Journal*, 1921, xxvii, 27.

The author draws his conclusions from a series of over 800 labors, the last 150 are reported. Complete amnesia was obtained in 80 per cent of the primiparæ, in 50 per cent of the multiparæ. Partial amnesia occurred in 20 per cent of primiparæ, in 30 per cent of multiparæ, and short labors prevented the drug being effective in the remaining 20 per cent of the latter.

The method employed is as follows: The patient, her ears filled with cotton, is placed in a quiet, darkened room from which the relatives are excluded. When labor is fairly well established (pains occurring regularly every ten minutes in a primipara, earlier in a multipara) morphine gr.  $\frac{1}{4}$  and hyoscine gr.  $\frac{1}{150}$  are given hypodermatically. Three quarters of an hour later and every hour after, the patient receives gr.  $\frac{1}{450}$  of hyoscine. To control restlessness morphine is used in the first stage, chloroform in the second. Chloroform is used when needed at delivery. On awakening from the sleep that usually follows delivery, the patient is unaware that labor has occurred. The author has found that large doses of morphine do not cause fetal oligopnea or asphyxia.

The largest number of doses of hyoscine given in any successful case was 53, the smallest 4. Although the patients may be restless, complain of pain or even be delirious, the end result is usually complete amnesia. Haultain thinks that the routine dosage of hyoscine is without danger, that these patients require less personal attention than those delivered in the usual way. An expert nurse

only is in attendance early in labor. The drug apparently shortens the first and probably delays the second stage somewhat. Forceps were used 41 times in the 150 cases. Three per cent of the babies were born oligopneic but needed no attention. Four babies were born asphyxiated, three after difficult forceps and one after delay with the aftercoming head. Scopolamine favors moulding in difficult cases. No dangerous complications were noted in the mothers. Two cases of mania were controlled with chloroform. The author believes that by removing the fear of subsequent labors, this procedure will increase the birth rate. The opposition to its general use resembles that seen at the time of the introduction of chloroform into obstetrics.

H. W. SHUTTER.

**Zweifel: Painless Labor.** *Muenchener Medizinische Wochenschrift*, 1922, lxi, 52.

The author claims, from personal observation, that "Twilight Sleep" does not increase the birth mortality, and in a series of cases of twilight-sleep-children, followed for over ten years, there has been no evidence that this form of amnesia gives rise to any permanent injury.

S. B. SHOLHAUG.

**Gerson: Twilight Sleep.** *The Lancet*, London, 1922, ccli, 428.

The author gives a résumé of his experience in conducting seventy-five confinements under twilight sleep. He kept very careful records of every sign and symptom, and all dosages were charted at the time given.

His technic in the case of a multipara was to commence the treatment as soon as labor set in. The first injection consists of 1/150 gr. scopolamine and 1/3 gr. morphine. The second injection of 1/150 gr. scopolamine was given in one hour's time, true amnesia generally being obtained three-quarters of an hour after this injection. The true state of amnesia was recognized by showing some familiar object to see if the patient recognized it. Analgesia was always complete regardless of the degree of amnesia.

The author found the use of forceps in the latter part of the second stage to be more frequent. In none of his cases could he attribute infant mortality to the use of drugs. Postpartum hemorrhages were in no appreciable way increased.

The author includes much valuable statistical data in his article as well as the results of his seventy-five cases.

NORMAN F. MILLER.

**Horwitz: Twilight Sleep and the General Practitioner.** *The Lancet*, London, 1921, cci, 1154.

The author gives his opinion regarding twilight sleep based upon personal experience. He makes it a rule never to give the first injection until pains are coming regularly every five or ten minutes. In multiparae treatment is commenced as soon as the patient is definitely in labor.

The technic used by Horwitz is given in detail in his article. He believes the first stage to be definitely shortened and the second stage frequently prolonged and operative delivery more frequently necessary. The author has had but little difficulty from asphyxia of the newborn child in these cases.

The advantage of twilight sleep is emphasized especially in breech cases, and in patients with a minor pelvic contraction and those suffering from a heart disease.

NORMAN F. MILLER.



**Opitz: The Alleged Danger of Twilight Sleep.** Muenchener Medizinische Wochenschrift, 1922, lxi, 261.

Of 4,279 births at the Universitaets Frauenklinik in Freiburg, 2,037 were conducted under "twilight sleep", and 2,242 without it. Among the former, 2.1 per cent were born dead or died within the first nine days; among the latter, however, the mortality was 3.75 per cent.

The author holds that in competent hands twilight sleep affords a protection rather than a danger to the child, but he does not consider it a procedure to be employed by the general practitioner.

S. B. SOLHAUG.

**Lembcke: Comparative Study of the Action of Twilight Sleep with Modified Technic.** Muenchener Medizinische Wochenschrift, 1921, lxxviii, 262.

The author compares the results (to both mother and child) obtained in his employment of morphine-scopolamine amnesia according to the "morphine-rich" technic of Siegel, with results obtained in the use of a modified "morphine-poor" technic. Essentially the difference is that in the latter the amount of morphine is reduced by one half, and the scopolamine increased by one-eighth over that of the classic procedure of Siegel. As concerns the mother, the modified technic gave amnesic results in 97.8 per cent of cases while the classic procedure yielded 92.0 per cent. With the modified technic 83.8 per cent of children breathed immediately on birth, 7.8 per cent before, and 8.3 per cent after the lapse of a minute, while with Siegel's technic the percentages were 38.3, 13.3, and 48.3 respectively. The mortality rate of Mayer is quoted who, deducting deaths obviously due to causes other than the scopolamine-morphine influence (such as placenta previa, contracted pelvis, premature separation of placenta, etc.) found that 1.1 per cent of children died as the result of birth trauma with the morphine-rich technic as compared with 0.5 per cent with the modified morphine-poor technic.

S. B. SOLHAUG.

**Liegner: Labor Under Simplified Schematic Twilight Sleep.** Deutsche Medizinische Wochenschrift, 1922, xlviii, 424.

Liegner is opposed to the schematic method of twilight sleep as proposed by Siegel. He holds that no potent drugs should be given according to a fixed schedule, but that individualization is imperative in their administration. Even with the modified method, he has seen unmistakable evidence of retardation of labor, deleterious effect upon the mother and asphyxia and death of the fetus. This in spite of the reduction of the dosage of morphine and the addition of quinine.

He concludes that the administration of twilight sleep of any sort is out of question in general practice. Even under the most fortunate hospital conditions and with most expert attendants, he feels it should be employed only in exceptional cases and then only under the continuous personal supervision of the obstetrician.

R. E. WOBUS.

**Schellekens: Analgesia During Labor.** Nederlandsch Tijdschrift voor Geneeskunde, 1921, ii, 2060.

After mentioning briefly the use of chloroform and ether in labor, the author reviews rather exhaustively the literature on twilight sleep, which brings him to the conclusion that the unpleasant effects on the mother and, especially the danger to the fetus, makes it an unjustifiable procedure. The pudendal anes-

thetia proposed by van Ilmer has had little support and has been generally discarded by those who have used it.

Sacral anesthesia, as first used by Cathélin, has given rather satisfactory results and has been recommended by various obstetricians, especially Stoeckel. Various operators have used solutions containing  $\frac{1}{2}$  to 2 per cent novocaine usually with sodium chloride or bicarbonate as well as adrenalin. From 20 to 30 c.c. are injected into the sacral canal while the patient lies with her hips slightly raised and the knees drawn up. After the needle is inserted, and before injecting the solution, the piston is withdrawn partly to exclude the possibility of injecting into a vein. Since all methods of analgesia have a tendency to weaken the pains, Schellekens made his injections only after the cervix was dilated and then noticed no effect on the contractions. If necessary, a further injection of 10 c.c. may be made. His results have been very satisfactory and he reports absolute analgesia in his cases, some patients experiencing merely a feeling of pressure as the head passes over the perineum. R. E. WOBUS.

Gillespie: Relief of Pain in Labor. Ohio State Medical Journal, 1921, xvii, 669.

The author is an advocate of chloroform as an analgesic for the country doctor who must meet all kinds of emergencies and cannot carry a complicated apparatus everywhere he goes. He gives chloroform only at the beginning of the pain before the patient is aware that the pain is coming. The patient takes three or four breaths and then is made to bear down the same as in the use of nitrous oxide. The article includes a discussion on how to administer chloroform in a normal delivery; handling difficulties in obstetrical anesthesia; objections to anesthesia in labor; anesthesia in the first stage; the prevention of septic infection and conditions foretelling difficult and tedious labor. This is an excellent article especially for recent graduates, who are familiar only with the adverse side of chloroform. W. K. FOSTER.

Danforth: Nitrous Oxide-Oxygen Analgesia and Anesthesia in Normal and Operative Obstetrics. The Pennsylvania Medical Journal, 1921, xxiv, 383.

The paper is based on about seventeen hundred obstetrical cases in which nitrous oxide-oxygen analgesia or anesthesia was used.

The author's technic consists in beginning the administration of the gas at the onset of the second stage. The mask is placed over the face and the patient instructed to breathe deeply and quickly, the number of breaths required varying between three and eight, depending on the individual. It is essential for the best results to begin the administration of the gas immediately at the onset of a pain. The use of oxygen with the nitrous oxide is advised in percentages from five to fifteen according to the individual requirements. Cyanosis should be avoided at all times. With the end of the second stage a little ether is added to advantage.

The course of labor is not slowed by a properly given gas analgesia, on the contrary the effectiveness of each contraction is increased because of the marked relief from pain and the voluntary cooperation of the patient. The danger of postpartum hemorrhage is not increased. The nitrous oxide does not relax the uterine musculature to the same degree as other anesthetics. No untoward effect of the gas was noticed in the infants and in no instance could the nitrous oxide analgesia be charged with causing fetal death.

For various operative procedures as repair of the perineum, low forceps, induction of labor by the introduction of a hydrostatic bag; and in eclamptic or

toxic patients where ether or chloroform would have a deleterious effect upon the parenchymatous organs, nitrous oxide-oxygen anesthesia, aided by a little ether if necessary, proves very satisfactory.

In version cases ether anesthesia is advised.

With an experience extending over a period of five years, the author concludes that a certain technic is essential in administering the gas to obtain the most successful results. Further he believes the value of nitrous oxide-oxygen in relieving pain in normal labor, may be extended to many obstetrical operative procedures, provided the anesthesia be given with a reasonable degree of skill.

NORMAN F. MILLER.

**Sellers:** The Use of Nitrous Oxide—Oxygen Analgesia and Anesthesia in Obstetrics. *New Orleans Medical and Surgical Journal*, 1921, lxxiv, 109.

Nitrous oxide is advocated as being the nearest to an ideal anesthetic that we have at present because "it is inhaled like air; is practically odorless; is almost instantaneous in its action on the patient; is eliminated so quickly that the gas has left the body by the time the next pain is due; can be used for every pain." Chloroform and ether nearest approach nitrous oxide as analgesics but they are not quickly eliminated and have many other disagreeable features. Nitrous oxide-oxygen shortens the second stage, gives relaxation, does away with restlessness and rigidity in most cases, decreases exhaustion, allows a rapid return to normal for the mother and does not affect the baby.

The patient should be assured that the pain can be relieved. When the pain comes, give enough to relieve it so that the patient will have confidence in the procedure. Determine just the amount necessary for each individual patient, usually two to four breaths and hold the last one. Start the inhalations at the first signs of the approaching pain. It is concluded that nitrous oxide analgesia is an almost ideal anesthetic agent in obstetrics and makes the best anesthetic for operative obstetrics. Ether is the next best agent and chloroform and twilight sleep should not be used.

W. K. FOSTER.

**Vignes and Moreau:** The Analgesic Action of Nitrous Oxide on Uterine Pains. *Presse Médicale*, 1921, No. 24, p. 234.

Following the work of Lynch and Heaney, the authors have investigated the use of gas in eight primiparæ and one multipara during labor. They concluded that there was no toxic effect during administration either for mother or infant. The deliveries proceeded in normal time and manner. The gas seemed to have little effect on uterine contractions.

F. L. ADAMS.

**Oettingen:** Childbirth in Hypnotic Twilight Sleep. *Muenchener Medizinische Wochenschrift*, 1921, lxxviii, 265.

This is a report of a series of 16 women delivered at term under the influence of hypnotic suggestion, 14 of which were successful. The writer discusses the physiology of hypnosis and treats the subject historically. His treatment is begun three weeks before term; three or four women are hypnotized together, the power of suggestion being thereby strengthened. The suggestion is made that sleep can be regulated at desire, and that during sleep all pain ceases. Women coming in for delivery, actually in labor (pain), go to sleep very easily. A slight moaning or body movement during the pains reveals that labor is in progress. In the second stage, while patients do not reach the degree of excite-

ment experienced in scopolamine-morphine twilight sleep, they become restless and sometimes require three or four grams of paraldehyde rectally to deepen the sleep. Complete loss of memory or amnesia was achieved in six cases, partial amnesia in eight, with the stress of memory laid on inconsequential detail rather than on any pain experienced. The writer considers this an ideal adjunct to the conduct of labor and one that can be employed by any one giving it sufficient thought and attention.

S. B. SOLHAUG.

## Book Review

**Gynecological and Obstetrical Pathology.**—ROBERT TILDEN FRANK.  
D. Appleton & Co., New York, 1922.

In the preface, the author states that he has attempted "to co-relate information of interest to the clinician and pathologist in such a fashion that both will derive full benefit from this conjunction, and in the first paragraph of the introductory chapter he lays down the following important rule: "Cooperation between the clinician and pathologist is necessary to obtain the most useful results. The pathologist ought not to be a stranger at the bedside or in the operating room. The clinician should prove a welcome guest in the laboratory and at the autopsy table."

With these aims in mind of the author, and with his personal knowledge of his ability, the reviewer began his task with the most pleasant anticipations, but regrets to state that after a careful perusal of the book they were not entirely fulfilled. This is due in part to three main factors: First, that in attempting to make the work attractive to the clinician, a considerable amount of information irrelevant to the pathologist has been introduced, which impairs its scientific value. Secondly, the style is defective, in that it often lacks in clearness, and thus makes it difficult to distinguish between what is important and what is not. Moreover, the work suffers from a too casual or jocular tone, as, for example when the author speaks of the "occasional gynec operator" or states that "derivatives of the three layers of the embryo are arranged in a more or less orderly fashion in dermoid cysts, and scrambled together in a 'potpourri' in the solid teratomas." While it must be conceded that literary style is in great part a matter of personal taste, it is to be regretted that a work which will come into the hands of our better educated British confrères should be thus open to criticism.

In the third place many of the 338 illustrations leave a good deal to be desired. While many of the original drawings show clearly what is intended, they are so schematic as to bear little resemblance to what is actually seen under the microscope. Moreover, many of the microphotographs are so poor that they convey but little information to the trained histologist, and consequently must be almost valueless to the average clinician. Whether this is due to the use of too thick sections, or to imperfect reproduction on the part of the publishers, it is impossible to state, although I rather incline to the latter view.

Notwithstanding these somewhat general criticisms, the work gives evidence of wide experience and great industry on the part of the author, and must inevitably serve a useful purpose in bringing before the medical public some of the problems in which all gynecologists and obstetricians should be interested.

It would lead too far to attempt to discuss in detail the scope of the work, but in general it may be said that it begins with a description of the anatomy and

histology of the normal genitalia, and ends with a chapter on the glands of internal secretion in obstetrics and gynecology while its major part is devoted to the consideration of the pathological changes which occur in the generative organs of the nonpregnant and pregnant woman.

The first section of the work is very satisfactory, while the chapter on the relation of histology to function is very interesting. I cannot agree with the author that rupture of the ripe follicle "coincides with or closely follows after menstruation," as such a view is at variance with the most recent teachings, and if correct it would imply that the orthodox Jewess should be relatively sterile instead of the most fertile of women.

The anatomical considerations in connection with prolapse of the uterus are excellent, and should be read by every one interested in the subject.

The chapter on carcinoma of the uterus contains much excellent material, and the author's advice in connection with its diagnosis cannot be too strongly emphasized—"while a specimen may be suspicious, in a given case we are dealing either with a cancer or not."

The statement that chronic oophoritis is a misnomer, and that what is usually described as such is really a small polycystic degeneration, and may even represent only a transient condition, deserves commendation and should be remembered by many who still employ the term.

To my mind the section on ovarian tumors is not particularly satisfactory, and it seems a pity to replace the time-honored term multilocular glandular cystoma by that of "pseudomucin cyst adenoma." Indeed, it seems to me that the author has missed a great opportunity by failing to describe this condition adequately, as well as the characteristic histological changes occurring in dermoid cysts and in the destruction of the tube wall in extrauterine pregnancy. Furthermore, I cannot follow his advice in the case of unilateral papillomata that the unaffected ovary should be removed prophylactically; for had I done so several families of charming children, with whom I am acquainted, would never have come into existence.

The second part of the work on obstetrical pathology is of interest, for, so far as I am aware, it represents the first attempt of the kind in the English language, outside of the scattered statements in text books on obstetrics. To the obstetrician, it is particularly gratifying to find extrauterine pregnancy classified where it really belongs; namely, under obstetrics, although I cannot agree with the implication that primary abdominal pregnancy may occur, or that rupture of a tubal pregnancy is a more frequent termination than abortion.

Many sections in this part of the work could be amplified with advantage, and with some of the statements I cannot agree: particularly when it is stated that the hepatic lesions in eclampsia are comparable to those produced by phosphorus, chloroform and bacterial poison, as it seems to me a well-established fact that the former occurs about the periphery of the lobules, while the latter commence in their central portion.

Notwithstanding such errors, the book can be strongly commended to those who are unable to use the several German works upon the subject, while the full lists of literature at the end of each section reflect great credit upon the author's learning, and serve the very important purpose of impressing the uninitiated clinician with the fact that medical knowledge is not local or even national in origin.

J. WHITRIDGE WILLIAMS.

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## Original Communications

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### THE TEST OF LABOR IN RELATION TO CESAREAN SECTION. COMPARATIVE RESULTS OBTAINED BY ELECTIVE AND SECONDARY OPERATIONS BASED UPON A PERSONAL EXPERIENCE OF 92 CASES\*

BY RUDOLPH W. HOLMES, M.D., AND ALLISON L. BURDICK, M.D.,  
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SINCE Edward Reynolds<sup>1</sup> presented a thesis on "The Superiority of Primary Over Secondary Cesarean Sections, etc.," before this Society, in 1907, there has been a massive accumulation of literature covering the subject. In the fifteen years since it was written it has had a profound influence in developing the principles governing the safe performance of cesarean section. This paper has also been a guiding lesson to the senior writer these many years in his endeavor to formulate rules for a safe conduct of women who would have potential difficulties in labor which might necessitate suprapubic delivery. With increasing experience he has amplified, from time to time, his general rules so that now he believes it is possible to lay down concrete directions which will vouchsafe to the woman essentially the same security after the labor has been in full force for a period, as when the section is done before contractions have begun. In fact, that the purport of this paper may be fully appreciated, contrary to the generally accepted views,—and which the senior writer has likewise always corroborated in the main until a careful analysis of his cases these late years convinced him to the contrary,—there is com-

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paratively little difference in the safety of the operation when performed in advanced labor, before the advent of exhaustion, over those operations performed in the last days of pregnancy. There are certain fundamental facts which stand out very clearly in making this statement valid: first, the dangers fall or rise directly as the woman has been managed properly or improperly before and in the hours of labor; secondly, the surgical judgment, the obstetric conscience in carrying out an aseptic technic, character of the personnel of the operating room, influence the outcome as much as any adventitious circumstances incident to the labor. *Per se*, the length of labor within the safe limits is of comparatively small significance, but vaginal examinations, or attempts at delivery from below are fraught with a high proportion of disaster; likewise, procrastinating until the vital forces are at the lowest ebb places the woman in jeopardy; again, *prolonged rupture of the membranes offers a serious menace to the welfare of the woman during the postoperative period*. We may place it as a definite criterion that the woman who has a truly elective operation will run a more placid, an infinitely more comfortable convalescence than she who has been subjected to hours of a distressing labor. It is essentially true that those given the test of labor practically will run the same thermal elevation as those who have had the elective section, but the former will have a continuance of that thermal course longer than the latter—an expression of lack of resistance incident to tiredness. The longer the woman is in labor, with membranes ruptured, more characteristically will the pulse have a higher rate with a more prolonged elevation of temperature over those not in labor, or with membranes intact. Further, it is clearly evident from our study of these 92 cases that some 10 to 20 per cent of women operated upon in labor, more glaringly evident if the membranes have ruptured, will run a more stormy course with a somewhat prolonged thermal elevation,—a true, though mild septic course; the clinical picture of these is distinctly worse than any of those operated electively. We will put this in concrete form in the statistical part of this paper.

While preparing this contribution we have speculated much on what constitutes the danger in a delayed cesarean section; we feel that we have much to learn of the vital forces which are compromised by hours of labor. How much is due to impairment of immunity to bacterial invasion sequential to the fatigue of labor? How much is due to the setting free of protein bodies, or by-products from forced metabolism? How much is incident to the bacterial flora so commonly the habitants of the vagina, ordinarily relatively innocuous, yet, at times, offering a serious menace to their host? Does the reparative process in the uterine incision determine cross currents, reversal of currents in the blood stream and lymphatics which carry

the bacteria to the wound! Two things stand out very clearly: one, that modern science demands that there shall be a ready clinical test which determines the patient's immunizing power, not only in this connection but for all preoperative investigation; again, a reliable test which shall determine the innocuousness or danger lying in the vaginal flora. There may be no question that with membranes ruptured a large element of risk is determined by the exposure of the presenting part to the bacterial content of the vagina, innocent on the mucosa, but dangerous when rubbed off onto the uterine or abdominal wounds. Certain it is that vaginal examinations or unwise attempts at delivery mechanically spread the inherent risk.

The opportune time for a cesarean section necessitated by gross cephalopelvic disproportion is at a designated hour, a truly elective procedure; likewise we believe that the dangers from rupture of a previous cesarean scar, the scar of an early hysterotomy or the scar of a myomectomy which demanded an incision quite through all the muscularis, are so great that a timely elective section should be the rule in such cases. The absolute indication is not germane to the topic under discussion and is herewith dismissed. The danger of rupture of the uterine scar is one which may not be lightly decried; it is of small consequence when the section was dictated by absolute deformity for, perforce, the section must be repeated at the end of each succeeding pregnancy. In the presence of relative indications, or the many adventitious circumstances which prompted the sections, subsequent pregnancies may not necessarily have to be terminated by laparotomy were it not for the consideration of the scar. This danger is so acutely appreciated in our minds that we fully and unequivocally subscribe to the dictum, "a cesarean once, a cesarean always." Case 32 was a woman who lost her first baby in an instrumental labor; her second labor terminated spontaneously, but an able gynecologist was called to remove the placenta which had escaped into the abdominal cavity through a transverse fundal rent; he sutured the rent. She came to us in her third pregnancy, six weeks before term. In view of the scar we planned to anticipate labor by cesarean section; unfortunately labor started before this designated time. Seven hours after the onset of labor the abdomen was opened; the scar had failed to unite through one-half its extent and the peritoneum alone held. Fortunately rupture had not occurred.

Is the danger of rupture real or imagined? Those who deny the probability of the rupture argue from the cases which passed through a spontaneous labor happily; the others base their contention on the calamities which have occurred, on the incidence of rupture. Harrar<sup>2</sup> found in 50 repeated sections, 42 scars had healed perfectly; 4 were attenuated; 2 had partial rupture; 2 had complete loss of integrity—



in other words, the liability of rupture according to his figures is 16 per cent. Asa B. Davis<sup>3</sup> reported 33 repeated sections; 23 had perfect scars; 3 were thinned; 2 had partial rupture, and 1 had a complete rupture—that is, his incidence of vulnerable scars was 18.1 per cent. v. Leuwen<sup>4</sup> found the scar thinned, or worse, in 20 of 117 repeated sections, 17 per cent had dangerous scars. More recently, Holland<sup>5</sup> collected 92 cases of uterine scar rupture in England; 48 ruptured in labor and 34 before contractions began. He states the danger of rupture in relation to spontaneous labor is 1:4. Certainly these figures should arouse our interest. Though this topic is pertinent to the subject of relative indications, neither time nor space will permit an academic discussion of the production of vulnerable scars; they may occur in the most expert of hands.

In contrast to the absolute indication, the relative necessity offers a problem which does not exist under the imperative demand, the woman in the former class always will require the section; in the latter, later labors may not offer an indication for the operation. Are we to set the time for the performance of an ideal, elective section on a woman who may readily have a spontaneous birth, or are we to heed Schroeder's aphorism, "watchful expectancy," judiciously awaiting her to prove or disprove her functional ability? We know that fully 60 to 80 per cent of women with pelvic contractures of 8.5 to 9.5 cm. will have spontaneous labors, or at most aided by not difficult instrumentation. Are we to subject such arbitrarily to the risks of a cesarean, when normal labor so largely is probable, merely that the few who properly should have such aid may be saved a reasonable test of labor, which, withal, does not increase their hazard greatly? We do not believe such radicalism is justifiable.

Whatever may be said, a cesarean section, for the mother, does not have the security of life and health in comparison to normal parturition; neither is the sum total of discomfort or pain less for the section than a normal delivery, even with a forceps delivery of not inconsiderable difficulty. Error of obstetric judgment is too finite; how often we hear of women who have been told they had insuperable difficulty facing them, only to disprove the allegation by a labor of surprising ease; a delphic prognosis were better than such positive assertion.

There has been much incidental mention of giving a woman a test of labor in more or less elastic phraseology, but the literature is sadly lacking in concrete detail of what that test implies. As the senior writer has for many years had his formulated rules in relative disproportion and has had his meed of success, we believe a summary of his results will not be without interest, and certainly will give opportunity for a timely discussion as to what constitutes a test of

labor, and to what extent we justifiably may go in that test. We believe the first great development in laying down these rules was the abstinence from vaginal examinations; in the first 32 cases, up to the close of April, 1912, 16 cases of cesarean section were without vaginal examinations in relation to labor, i.e., 50 per cent; the second great stride was in the routine employment of rectal touch in 1913. Our rules comprise the following:

1. Internal mensuration in pregnancy determines the certainty of pelvic deformity, and its degree. We believe the general teaching that external pelvimetry is invaluable in determining pelvic capacity has done irreparable harm, for it is only by internal palpation and mensuration that any fact of worth is elicited.

2. As definitely as possible the probable date of confinement is determined.

3. Two or three weeks before this date the presentation and position are determined: the cephalopelvic relationship is fixed as clearly as possible. At this time the pelvic capacity, determined in pregnancy, is verified. The patient and husband are warned of the dangers of coitus during the last months of pregnancy, an admonition that goes to all patients.

4. Labor is awaited, or at times, the contractions are started, if possible, by castor oil and quinine.

5. The usual external preparation is made, which comprises shaving, sponge bath, enema, local cleansing, but the vagina is not entered.

6. During the early hours of labor the woman is encouraged to partake of simple liquid or semisolid food, for commonly the weak, irregular pains, so characteristic of cephalopelvic disproportion, may endure for many hours, even some days.

7. If rest is materially disturbed by a protracted nagging labor, temporary relief is given, when needed, by chloral-bromides, by mouth or rectum. Also, those with tumultuous labors are given occasional relief by the same means; morphia rarely is exhibited; scopolamine has not been employed for years.

8. Control of the pulse and temperature at frequent intervals, every two hours generally, but more frequently if there be an irregularity or increment in the pulse rate. The pulse is the valuable index of the fatigue of the woman, the general facies of distress is valuable. When the pulse rises to 90 or 100 the patient is actually reaching a stage which if allowed to continue much longer may mean true exhaustion. The resistance to pain and the stress of labor vary so enormously, one may require an earlier intervention even though she has not had an adequate test, another may safely go many hours without untoward symptoms. To continue the watchful expectancy beyond the safe limit jeopardizes the safety in a section, or makes the eventual high forceps or craniotomy imperative.

9. Control of the fetal heart.

10. If possible the time should be awaited until the os is dilated, and the membranes have ruptured; when the membranes rupture prematurely, and the head does not descend to fill the cervix, dilatation will be arrested; premature evacuation of the amniotic sac with little or no dilatation warrants a more prompt determination for the section; it is only by the opportune rupture of the fetal sac that a positive test is given.

11. During the whole course of the test of labor, control should be kept by periodic abdominal palpation and rectal touch. Rectal examinations as a routine procedure in labor were first advocated by Kroenig<sup>6</sup> and Ries<sup>7</sup> in 1893. Practically no further contributions were made until the senior writer, in 1915,<sup>8</sup> reiterated the great advantages of routine rectal over vaginal examinations in labor. For the conduct of a case which may require a section after a test of labor, it is the most

valuable adjunct contributed to the cesarean question these last ten years. From it, every fact relevant to the correct interpretation of all phenomena of labor may be accurately determined, except the pelvic deformity and the nicety of adjustment of the head to the brim; as the former is generally determined in pregnancy, this is of no moment,—the latter may offer a problem. My associates have been taught not to make vaginal examinations unless specifically advised.

#### THE OPERATION

We have firmly adhered to the principles of the classic section with some minor deviations, for in our hands the method has proved of signal worth. Therefore, the uterus is always eventrated, unless conditions dictate otherwise, through as small an abdominal cut as possible; we see the only objection in the unseemly long wound. The uterus is promptly clothed with moist compresses; at the same time the abdominal wound is closed back of the uterus with a bullet forceps—at times, if there be intestinal distention with tendency for their protrusion, a pad is inserted before the forceps is applied. The field is then closely encompassed with towels. As the incision is being outlined, the assistant injects one, sometimes two, ampules of pituitrin in the uterine muscle. After outlining the opening in the uterus with the scalpel, the wall is punctured carefully at the midpoint, the index fingers introduced within the wound and the wall is torn, a method which has been followed with few exceptions since the second section. The tearing has the great advantage of never bleeding unduly in our hands, is easy of repair, is more quickly done, and expedites the delivery of the child if the placenta be anteriorly placed, for the one act opens the uterus, separates the placenta, and opens the membranes. Suturing has always been done with catgut with the exception of the first two cases where silk was used; the chromic gut is tied with every other suture. We feel that the safety of the woman lies in the close obliteration of all dead spaces; a continuous suture will loosen under the influence of retraction, and from imbibition of moisture. Few will agree with Kerr<sup>6</sup> that silkworm gut is the ideal uterine suture material or that the cervix and vagina should be sponged out. We have adhered to the old method of eventration as we believe there is an inevitable spill of blood and liquor amnii in all methods of cesarean, and by eventration this danger is minimized. In our experience blood is almost never seen within the abdominal cavity and the amniotic fluid likewise is kept away. We have often thought that adhesions were produced more by amniotic fluid than blood or careful handling with gloves.

We have been strongly influenced by the belief the lessened hazards of cesarean section, in safe hands, lie more strongly in the adoption of sound surgical principles, rather than in the many deviations of technical detail suggested during recent years. Twenty years ago

there was a fervid discussion on the relative merits of various types of incisions, from the posterior median of Cohnstein, the transverse fundal of Fritsch, the typical Saenger, and finally the transverse cut through the lower segment of Kehrer. At this period Kerr summed up the situation by declaring Fritsch's incision had the greatest advantage in being farthest from the cervix. Is this still valid? We wonder whether the procedures of Sellheim, of Frank, etc., are not an expression of novelty rather than permanent value. All will agree that the peritoneum of the upper abdomen has not the same resistance to infection as the pelvic, but we await the proof that the cervical peritoneum is less vulnerable than the corporeal.

#### STATISTICAL DEDUCTIONS

There were 92 cesarean sections, of which 29 (2 eclamptics) were done before labor; 61 were in labor and in two, data were not available covering the point. Of the women in labor, 22 were operated upon with intact membranes; the range of labor in these was from 2 to 104 hours, an average of 26 hours. Membranes were ruptured for a definitely stated period in 22 women, a range of from 1 to 84 hours, an average of 22.2; the labors varied from 7 to 84 hours, an average of 30 hours. The period the membranes had ruptured is an actuality but we must take with reservation the duration of some of the abnormally long labors. For example: Case 56 (1916) was a repeated section; she did not come to the hospital until weak, irregular, nagging contractions had persisted for 102 hours; the section was done two hours after her admission. Again, Cases 39 (1913) and 49 (1915) were of similar character. We doubt the endurance of any woman to be in good condition after having strong, tumultuous labor for 48, 72 or 104 (!) hours. The very fact that the patients in Charts 3 and 4 (membranes ruptured for 24 to 84 hours) had a better composite temperature curve than the other divisions is *prima facie* evidence that they did not have exhausting labors.

There were 52 primiparae and 37 multiparae, respectively 56.5 and 40.2 per cent, the youngest being 17 and the oldest 44 years of age.

#### INDICATIONS

Of the 92 cases the pelvis was below 9 cm., i.e., 8.5 or lower, in 34 instances; in this number one had such a pelvic deformity that complete coitus was impossible; she had repeated sections; 20 had a conjugata vera of 9 cm. Eleven (11) women had repeated sections, two of which had three sections each. In twelve the pelvic contracture was not stated or the record was missing. Placenta previa dictated the section five times in the presence of minor deformity, one had placenta previa centralis with fibroids; eclampsia twice (once

with a c. v. of 8 cm.). Albuminuria (toxemia) four cases; heart disease four; two had congenital dislocations of hips. Ventral fixation and adhesions from repeated laparotomies, two cases. These were the principal indications which may be enumerated.

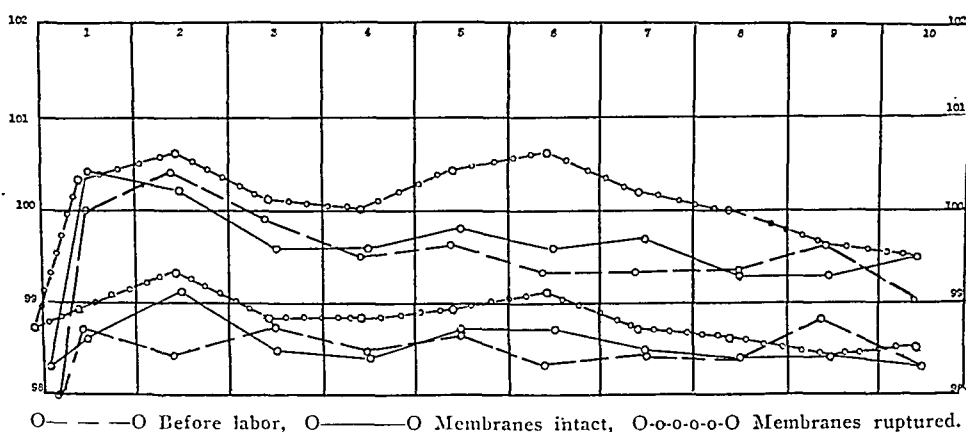
### MORTALITY

During the period covering this report, from 1900 to the present time, six mothers died. Two died of eclampsia [Nos. 29 (1911), and 90 (1922)]. The first was doing well when she had a recurrence of convulsions on the second day, five in an hour, and died; the second section was done to save the baby, believing the woman was to die,

CHART 1

#### TEMPERATURES—HIGH AND LOW—COMPARED

Before Labor	27 Cases,	Mortality, 0%,
Membranes Intact	22 Cases, Labor 2-104 Hours:	Mortality 9%, Corrected 0%
Membranes Ruptured	25 Cases, M. R. 1- 84 Hours:	Mortality 8%, Corrected 4%



as after a phlebotomy and 4 to 5 hours of expectant treatment the blood pressure was 255-130; she died after the thirteenth convulsion. Both babies lived.

Cases 1 (1900) and 4 (1905) died respectively of peritonitis and general sepsis; No. 5 (1906) was diagnosed as gastric dilatation, but the fact that she ran a mild febrile course suggests peritonitis as responsible for the projectile vomiting. No. 82 (1921) had had a severe cold for days, 10-24 days before labor set in; at the time of entering the hospital she still had some laryngeal irritation, and a temperature of 102.3° F. within 20 hours of the operation, which remained high until death. She promptly developed a right pleurisy with effusion, the left pleura later became involved; the day of her death the wound showed no redness, though there was some slight serous discharge. The membranes had ruptured 24 hours before the onset of labor, the latter lasting 21 hours; the baby was born with

an offensive, putrid odor, but lived. Had she a focal infection, the atrium being her throat? This was the concurrence of opinion.

The eclamptic deaths should not be considered in connection with the mortality incident to non-toxic conditions, leaving four deaths following cesareans for pelvic indications, or other anomalies. Are we permitted to consider that the first five patients were operated upon in the period of learning, and may we segregate them from consideration of the modern mortality? We believe it is seemly. Therefore, our gross mortality was 4.4 per cent, corrected it is 1.17 per cent.

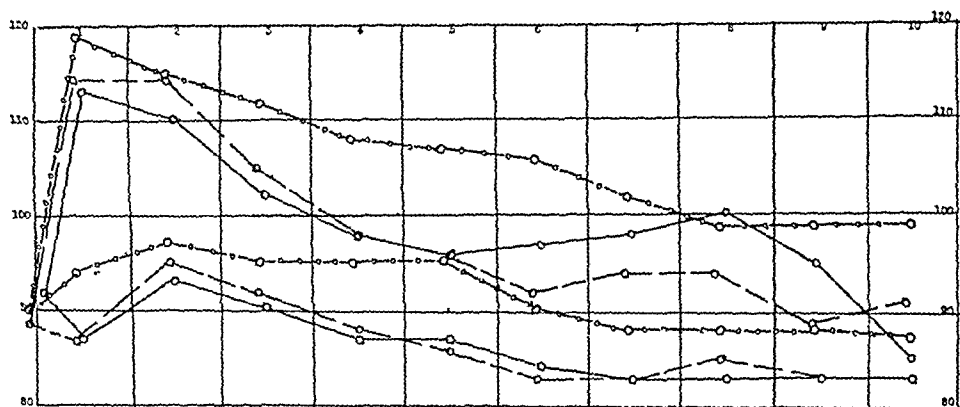
#### INFANT MORTALITY

Eight (8) babies succumbed either in labor or within fifteen days. Two infants were born dead after prolonged labor: in No. 8 (1906)

CHART 2

#### PULSE RATES—HIGH AND LOW—COMPARED

Before Labor 27 Cases, Mortality, 0%,  
 Membranes Intact 22 Cases, Labor 2-104 Hours: Mortality 9%, Corrected 0%  
 Membranes Ruptured 25 Cases, M. R. 1-84 Hours: Mortality 8%, Corrected 4%



— — — — — Before labor, — — — — — Membranes intact, — — — — — Membranes ruptured.

there was a large dermoid of the ovary blocking the brim; No. 11 (1908) had the pelvis filled by a massive cervical fibroid. One, Case 3 (1905) succumbed to a toxemia of the mother which developed into a post-partum eclampsia. One, Case 17 (1909) died on the tenth day after many convulsions, the pediatrician diagnosing the condition as meningitis; was it not more probably a brain hemorrhage, produced by prolonged labor? One, Case 15, died on the fifth day from melena and a high grade pemphigus neonatorum. Two, Cases No. 21 (1910) and No. 86 (1921) had hydrocephalus, the first also had an extensive dorsolumbar spina bifida; the mother of No. 21 was also Case No. 10, operated two years previously. Case 86 (1921) was a woman who had lost five children, was intensely anxious to have a living child; she was enormously distended, which precluded accurate pal-

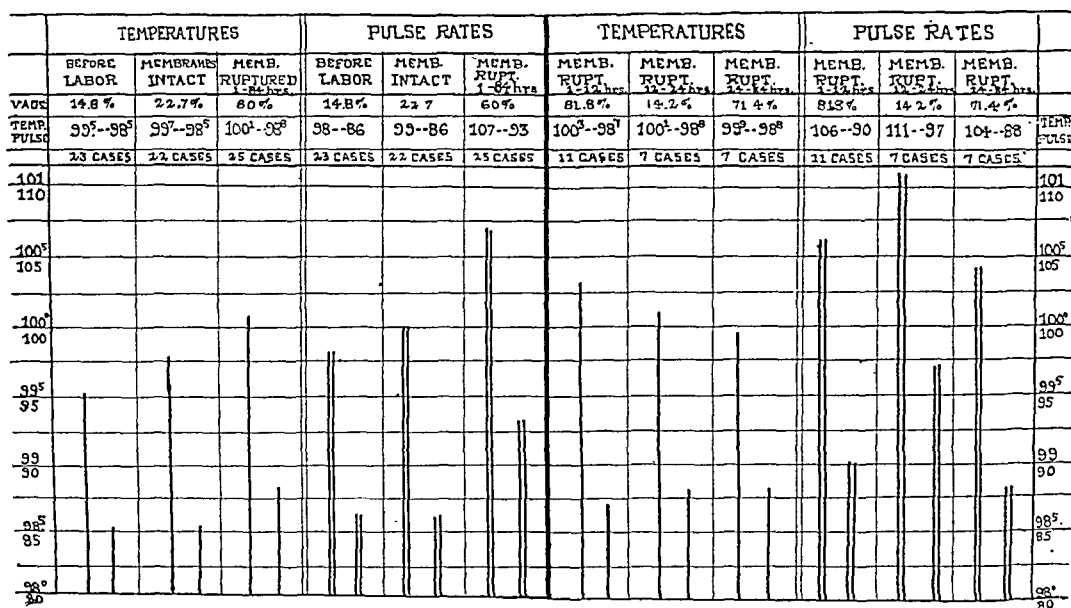
pation. The heart sounds pointed to a breech presentation which was proved at operation. To have hydrocephalus, or other gross fetal abnormality of structure is a lamentable catastrophe, and especially in a cesarean section; the one redemption in the latter instance was that the parents, as in the former case, on account of religious tenets, precluded craniotomy. One, Case 88 (1922) died on the fourteenth day from enteritis.

Therefore, there were six fetal deaths in the first 21 cases up to 1910, four of which were accidents of birth; two, after 1910, which had no connection with the birth. There was a gross loss of eight children (8.68 per cent); incident to birth, four children (4.34 per cent). In the last 75 cases there was no infant mortality due to birth.

CHART 3

## DIAGRAMMATIC PRESENTATION

AVERAGE OF ALL HIGH AND LOW TEMPERATURES AND PULSE RATES FOR 10 DAYS



## MORBIDITY

Various plans were devised for the purpose of showing graphically the incidence of morbidity in the various possible classifications of our cases; the one finally adopted was to segregate the cases into those operated upon before labor, those in labor with membranes intact, those with membranes ruptured up to 12 hours, 12-24 hours, and 24-84 hours. In this way we obtained 23 cases in the first, 22 in the second, 11 in the third and 7 each in the final two groups. There were insufficient cases to attempt a classification on the concurrent duration of the labor and rupture of the membranes.

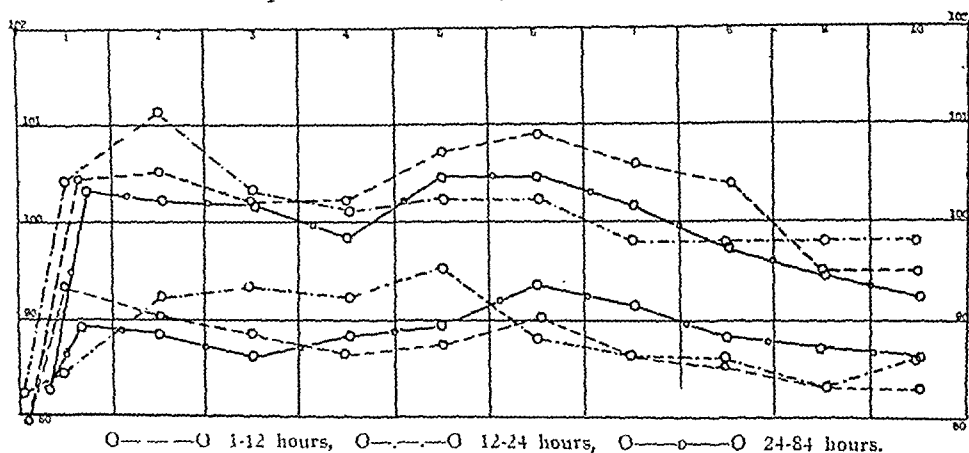
In our plan the observation of pulse and temperature last made

before operation was the initial point. Next the high and low pulse rates and temperatures for each day, irrespective of the time of day of their occurrence, were tabulated for ten days. Morning and evening temperatures were hardly comparable as only too often the high points were reached in the early morning hours. After arranging our cases in the above divisions, the high and low temperatures and pulse rates were averaged for the purpose of obtaining composite curves for the respective divisions. In obtaining the data for graphic presentation (Chart 3) for the high and low points of pulse and temperature, the averages of each for the entire ten days were obtained.

CHART 4

## TEMPERATURES—HIGH AND LOW—COMPARED

Membranes Ruptured—1-12 Hours,	Labor 7-57 Hours, 11 Cases
Membranes Ruptured—12-24 Hours,	Labor 12-24 Hours, 7 Cases
Membranes Ruptured—24-84 Hours,	Labor 13-84 Hours, 7 Cases



From the fact that 15 (65.2 per cent) of the 23 patients operated upon before contractions occurred had a temperature of 100° or below permanently after three days, we took this as the index of the duration of febrility, normal or postoperative reaction. Taking the list as a whole we find that of 82 cases, 42 (51.2 per cent) were 100° or below by the third day. Therefore, we may state that three days is normal for the postoperative thermal elevation to endure. The ideal would be not to have one febrile day over 100°—no, not to have one above 98.6°—one case approximated this perfection, No. 28, 24 hours in labor with membranes ruptured a like period.

On this basis, women operated upon before labor will reach the postoperative normal on the average in 2.7 days (Chart 8); in labor with membranes intact in 4.6 days; membranes ruptured 1 to 12 hours in six days; membranes ruptured 12 to 24 hours the postoperative febrile course will be over in 7.28 days; most anomalous of all, seven patients with membranes ruptured from 24 to 84 hours, and labor lasting from 24 to 84 hours, the normal was reached in 3.8 days. As

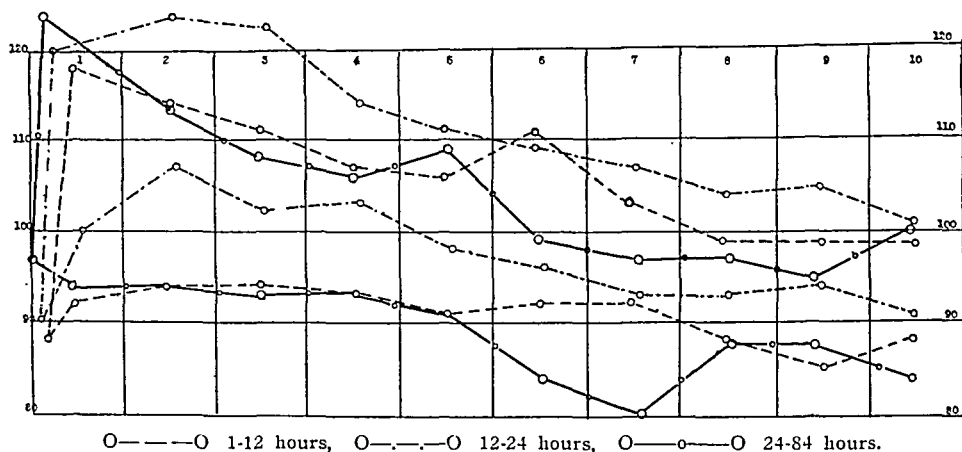


a whole, membranes ruptured from 1 to 84 hours will show convalescence in 5.7 days. The evidence of this is further manifested in the composite temperature curves (Chart 1). Again, we believe a short, intensely tumultuous labor, say up to 24 hours, menaces a woman more who has a section than she who has a very protracted period of aberrant contractions of no great intensity, even though her membranes have been long ruptured; leaving all other considerations aside we feel there is justification in the belief that forced metabolism from violent physical endeavor produces by-products which are intensely inimical to a woman in labor, especially if she have a section; very probably this vital deterioration produces an arrest of immunity.

CHART 5

## PULSE RATES—HIGH AND LOW—COMPARED

Membranes Ruptured—1-12 Hours,	Labor 7-57 Hours, 11 Cases
Membranes Ruptured—12-24 Hours,	Labor 12-24 Hours, 7 Cases
Membranes Ruptured—24-84 Hours,	Labor 13-84 Hours, 7 Cases



## TEMPERATURE BEFORE OPERATION

The temperature before operation was  $99^{\circ}$  to  $99.4^{\circ}$  in 14 patients, all the rest were below  $99^{\circ}$  at this time, with two exceptions, Cases 77 and 90, the latter an eclamptic, and the former, the one who had catheterization of the uterus the day before. These two had  $101^{\circ}$ . Roughly the incidence of postoperative reaction in women operated upon before labor on the first day for temperatures  $100^{\circ}$  or below, and  $100^{\circ}$  to  $101^{\circ}$  will be respectively 49.2 and 33.9 per cent; further on the second day these temperatures will be respectively 26.4 and 52.8. Thereafter, if convalescence is assured the high temperature will drop to below  $100^{\circ}$  and will there remain. This is well shown in Chart 1; while the temperature has descended to a point below  $100^{\circ}$  on the third day, the pulse only descends to a rate below 100 on the fourth day, and remains about 90 to the tenth day. (Chart 2.)

The composite curve for the 20 patients who were operated with membranes intact, in labor from 2 to 104 hours, shows an initial rise the first day about a half degree higher than those operated before labor, falls slightly below the latter on the second day, but then continues slightly higher until the eighth day. The pulse rate is lower to the fourth day; on the fifth day it continues somewhat more elevated to the eighth day, when it drops to a point below .90.

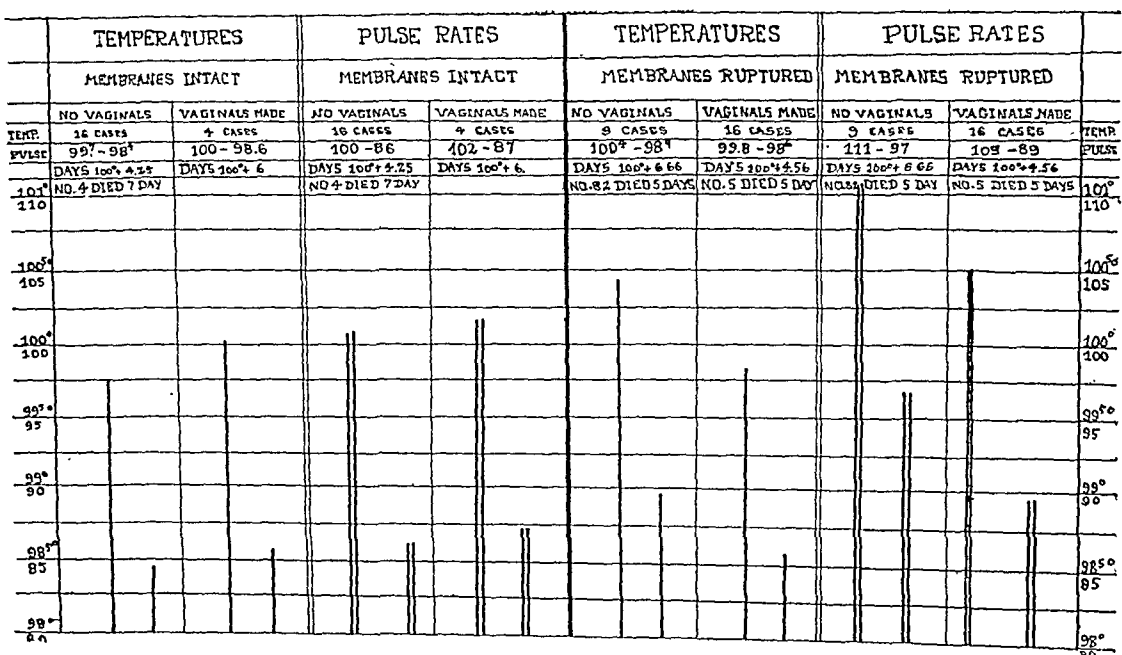
The composite temperature curve for those with membranes rup-

CHART 6

## DIAGRAMMATIC PRESENTATION

## INFLUENCE OF VAGINAL EXAMINATION

AVERAGE OF ALL HIGH AND LOW TEMPERATURES AND PULSE RATES FOR 10 DAYS  
MEMBRANES INTACT AND RUPTURED



tured from 1 to 84 hours, labor from 7 to 84 hours, has an initial rise to 100.2°, then rises higher than that for the other two groups, and continues over 100° for eight days (Chart 1). The pulse rate takes a comparable course, and is materially higher than either the groups operated before labor, and with membranes intact; the pulse only descends so that only by the eighth day is it below 100 (Chart 2). Chart 3 presents graphically the average of all high and low temperatures and pulse rates for 10 days. This chart clearly shows the malign influence of protracted periods of membranes ruptured upon the convalescence from cesarean sections.

Charts 4 and 5 show the average temperature and pulse curves in different periods of ruptured membranes. The initial rise of temperature the first day for the three groups, membranes ruptured from 1 to 12 hours, 12 to 24 hours, and 24 to 84 hours, is practically

identical. The temperature of the first group, from 1 to 12 hours, runs an even course until the fourth day, when it rises and persists higher until the eighth day, when it rapidly recedes. The second group, membranes ruptured from 12 to 24 hours, takes a sharp rise to 101.2° on the second day, declines by the fourth, and essentially has a more normal run the remainder of the time. The third group, membranes ruptured 24 to 84 hours, runs a more placid course than the first of this series. Chart 3 graphically presents these findings in the average of all high and low temperatures and pulse rates for

### CHART 7

#### PART I

#### TEMPERATURE COMPARISONS

#### OPERATIONS BEFORE LABOR. LABOR WITH MEMBRANES INTACT AND RUPTURED

	TOTAL CASES	100° or LESS			100°--101°			101°--102°			102°--103°			103°--104°			104°--105°			TOTAL
		NO	%	DAYS 100°+	NO	%	DAYS 100°+	NO	%	DAYS 100°+	NO	%	DAYS 100°+	NO	%	DAYS 100°+	NO	%	DAYS 100°+	
BEFORE LABOR	23				10	43.4	1.6	11	47.7	3.16				2	8.6	5				2.7
MEMBRANES INTACT	20	3	15.	0	6	30.	3	8	40.	5.8	2	10.	4				1	5	16	4.6
MEMB. RUPT. 1-12 hrs.	25	1	4	0	9	36.	4	7	28.	3.8	24	16.	7.5	22	8	6.5	2	8	15.5	5.7
MEMB. RUPT. 12-24 hrs.	11				3	27.2	7	3	27.2	3	2	18.1	9	2	18.1	6.5	1	9.0	4	6
MEMB. RUPT. 24-84 hrs.	7	1	14.2	0	2	28.5	3.5	3	42.8	5.6							1	14.2	2.7	2.8
MEMB. RUPT. 84-100 hrs.	7				4	57.1	2	1	14.2	7	2	28.5	6.5							3.8

OF THOSE IN BEFORE LABOR, 1 HAD TEMP. OVER 100, 6 DAYS. HIGH 103°. \*case 4 Died; †case 82 Died; ‡case 5 Died.

OF THOSE IN MEMB. INTACT 3 HAD TEMPS. 14 (1), 16 (2) DAYS OVER 100--HIGH TEMP. 102.

OF THOSE IN MEMB. RUPT. 1-12 hrs. 4 HAD TEMPS. 11 (2) DAYS, 9 (4) DAYS, 7 (4) DAYS TEMP. OVER 100 HIGH TEMPS. REEP 101-102°, 101-101°

OF THOSE IN M.R. 12-24 hrs. 1 HAD TEMP. OVER 100. 27 DAYS--HIGH TEMP. 104°--M.R. 24-84 hrs. 2 HAD TEMPS. OVER 100: HIGH TEMPS. 102-101°

#### PART 2.

#### CAESAREAN SECTIONS WITH APPENDECTOMIES. COMPARED WITH PART I.

BEFORE LABOR	23				10	43.4	1.6	11	47.7	3.16				2	8.6	5				2.7
MEMBRANES INTACT	20	3	15.	0	6	30.	3	8	40.	5.8	2	10.	4				1	5	16	4.6
MEMBRANES RUPT. 1-12 hrs.	25	1	4.	0	9	36.	4	7	28.	3.8	24	16.	7.5	22	8	6.5	2	8	15.5	5.7
TOTAL APPENDECTOMIES WITH CAESAREANS	10	2	20.	0	6	60.	3.1	6	60.	4.8	3	30.	6.3	1	10.	4				3.8
APPENDECTOMIES CLASSIFIED BY PERIOD	6				2	33.3	1.5	3	50.	2.3				1	16.6	4				2.5
MEMBRANES INTACT	5				2	40.	2	2	40.	8.5	1	20.	4							5
MEMB. RUPT. 1-84 hrs.	9	2	22.2	0	2	22.2	6	3	33.3	4.6	2	22.2	7.5							4.5

\* CASE 39 LABOR !! 96 hrs., M.R. ? HIGH TEMP 99° + 2 HAD 2 VAGINALS, each

CASE 54 LABOR 39 hrs. M.R. 80 HOURS. HIGH TEMP. 100

10 days. *A priori*, we should expect a more stormy convalescence for the third group than the others; we believe this anomaly is explainable on the ground that their labors averaged a less intensity of contractions; as a result the by-products of forced metabolism were not so actively produced. In consonance with this we find that in the second group, the pulse rate averages high, the sequence of hard labor.

Further, these charts, Nos. 4 and 5 show in Groups 1 and 3 (membranes ruptured 1 to 12 hours, and 24 to 84 hours) the marked influence of the terminal temperatures of the patients who died; in Group 1, Case 5 died on the fifth day with a temperature of 104° which affected the average; then to continue the elevated rate four patients, Nos. 24, 50, 58, and 81 had a sharp transitory rise, even to 105°. In the third group, the terminal temperature of 82° brought

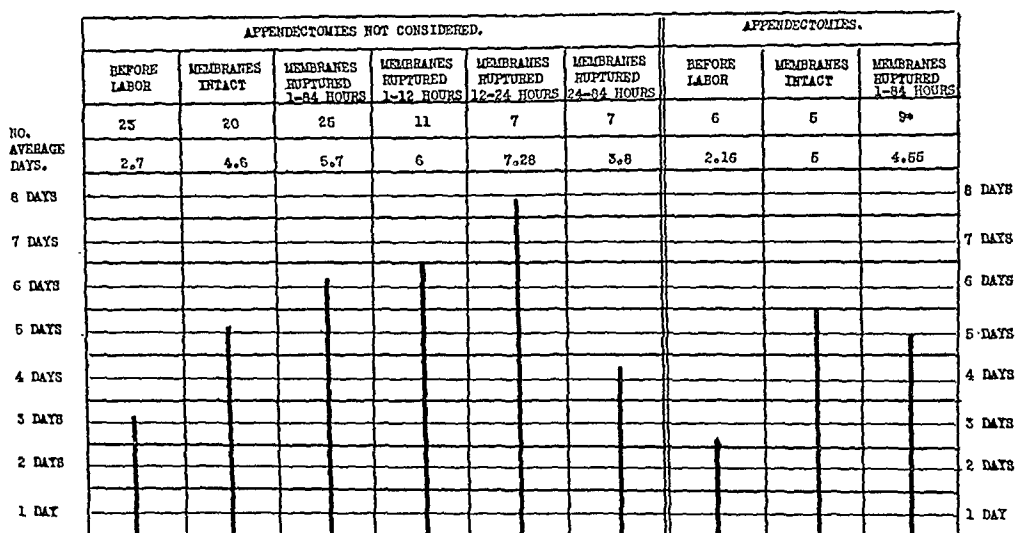
the curve up and was continued elevated by the fact that four patients on the sixth day had a temporary rise; the curves for the pulse rates showed a comparable course.

Do vaginal examinations increase the jeopardy of a woman who is about to have a cesarean section? It is manifestly impossible to eliminate all other factors which may unfavorably influence the welfare of the patient, and picture clearly the effects of vaginal examinations. Of our 92 cases, 58, i.e., 63 per cent, had no vaginal examina-

CHART 8

## DIAGRAMMATIC PRESENTATION

DOES APPENDECTOMY INFLUENCE THE CONVALESCENCE IN CESAREAN SECTION?  
DAYS OF MORBIDITY. TEMPERATURES OVER 100.



tions in relation to the labor; examinations were made on 29 patients, (33.7 per cent). Five records contained no statement pertinent to this point. In the first thirty-two cases (up to April, 1912) 50 per cent of the patients had vaginal examinations. In the last 10 years, out of 60 patients, 42 had no examinations (70 per cent). In eight patients there were two to five examinations in each, an average of 3+ for each. In every instance these repeated examinations were made before my entry on the case; eight had one examination each, in most instances done by myself, as the women were not seen before labor. We believe one of the factors which contributed a higher temperature in the diagrammatic presentation, Chart 3, for cases with membranes ruptured 1 to 12 hours than for 12 to 24 hours is, that among the former there were 81.8 per cent subjected to vaginal examinations against 14.2 per cent in the second period. The fact that the third period (24 to 84 hours) showed a reduction in temperature elevation in spite of 71.4 per cent of women having:

such examinations makes it probable their types of labors did not break down their bodily resistance to bacterial invasion.

The fact that those patients subjected to vaginal examinations whose membranes were ruptured had a lesser temperature reaction and a better pulse rate than those who were not subjected to this examination must be explained only on the assumption that other factors influenced the convalescence—data which are not available. However, we cannot too strongly urge the fact that repeated vaginal examinations do have their evil influence (Chart 4).

#### CONCURRENT OPERATIONS

In the course of these cesarean sections salpingectomy was done in seven instances to secure sterility; one woman had a single oöphorectomy for a small cyst; one woman had a double ovariectomy for ovarian cysts. One woman came to the section with the statement that at a previous operation, both tubes and ovaries were sacrificed, yet no evidence of any operation on the adnexa was found. Two patients had myomectomies. In consenting to the operation, the woman, Case 11, with the fibroid, absolutely refused to permit the hysterectomy, so the tumor was left; she stated that if she conceived once with the tumor she could again.

In 1912, Case 30 came to operation after four hours of labor, membranes intact, with no vaginal examinations. During my absence from town she developed a stormy period—at first symptoms were indefinite, but finally my colleague, Dr. N. M. Percy, convinced himself she had an acute appendicitis. After the delay in diagnosis it was deemed wiser not to operate. On the tenth day a sinus opened in the incision discharging a foul looking fluid, with fecal odor. She recovered without operation. About a year later a patient, No. 35 (1913) came for her second section, and asked that her appendix be removed as she was loath to return for another laparotomy. It was done; she had a temperature of 100.2° once on the following day and was in no wise disturbed by the additional procedure. In 57 cesarean sections the appendix has been incidentally removed 20 times (35.9 per cent). There has not been one demonstrable evidence of complication incident to the removal of the appendix. In the second patient, Case 37, where the appendix was removed, there was a febrile course for 14 days; she was in labor 50 hours, membranes unruptured, and had two vaginal examinations. We felt certain the clinical course was not compromised in any manner by the appendectomy. Appendectomies have not been done on women whom we felt should be placed in bed as quickly as possible, and where for any reason the prolongation of the operation was inadvisable. Under given circumstances, we feel there is the same justification, and the

same safety, in the removal of the appendix as in the course of any laparotomy. The average duration of febrility in the above 20. patients was 4.12 days; for those not in labor, the patients with appendectomies had roughly one-half day less elevation of temperature than those where it was not done; to offset this, appendectomies done in labor with membranes intact increased the febrility .4 of a day over the average; and was one and two-tenths of a day less than the average of those where the membranes were ruptured 1 to 84 hours. (Chart 7, part 2, and Chart 8.)

#### DELAYED CONVALESCENCE

In the first 37 cases the protracted thermal elevation continued for a period of 10 days or more (to 27 days) in 5 of the women—13.5 per cent. Since Case 37 (1913) four women had a delayed convalescence continuing 10 to 27 days, 7.2 per cent. Phlebitis occurred in one patient, No. 18, with one vaginal examination. An hemolytic streptococcic infection (Case No. 84) caused a most violent and alarming postoperative course for 16 days, excessively high, irregular temperature, chills, uterine hemorrhages, necessitating blood transfusions. At operation the placenta was found very firmly adherent—its removal exemplified the extreme difficulty which might be encountered in the manual removal of a placenta *per vaginam*. Also, there was a marked deciduitis, one plaque as large as the palm of the hand was loose and removed.

Stitch abscesses necessitating wet dressings were present in two cases; one other (No. 30) had the sinus which discharged a fetid, fecal fluid.

Postpartum hemorrhage occurred in two women.

The uterus was adherent to the abdominal scar in three instances; in one, after an automobile accident, the adhesion stretched into a long dense string; on account of repeated ileus the abdomen was opened. Of the repeated sections, one had no vestige of the uterine scar; in another the scar was hardly visible. Five had a number of small adhesions to the uterus or abdominal scar or both. In three the adhesions were very dense and diffuse.

#### CONCLUSIONS

1. The adoption of modern surgical principles has been the greatest means of reducing the risks of a cesarean section to the present minimal point.

2. The second great factor in lowering maternal mortality is the abstinence from vaginal examinations.

3. One of the most important contributions to the improvement in the safety of sections is the routine employment of rectal touch.

4. The eventual possibility of a section should be clearly and def-

initely determined in pregnancy. Every step in the subsequent conduct of labor should be subservient to this knowledge of potential difficulty.

5. An absolute pelvic deformity demands that the woman should have her section before labor sets in and at a set hour.

6. Conversely, unless there be imperative necessity, the woman with relative disproportion should be given an adequate test of labor.

7. The test should be so reasonably prolonged that there is neither the facies of exhaustion, nor an abnormally high pulse rise or temperature elevation.

8. The prolonged rupture of the membranes certainly has a very deleterious effect upon a woman in labor; if labor be unduly prolonged after the rupture a stormy convalescence is probable in 10 or more per cent, and the lethal outcome for the occasional woman is certain to occur.

9. A slow, long labor with weak, irregular, aberrant contractions, is not so dangerous if a section be performed as a shorter, but violent type of labor.

10. A hard labor in all probability liberates protein bodies, or other by-products of forced metabolism which are inimical to the convalescence of the woman subjected to cesarean section, possibly with the destruction of her immunity.

11. A cesarean section performed before labor spells almost certain success in skilled hands with a minimum of physical distress.

12. Labor increases the physical distress, and may jeopardize the convalescence.

13. Above all things, prolonged labor, with prolonged rupture of the membranes, with vaginal examinations, or futile attempts at delivery from below, spells disaster.

14. Cesarean section is far more dangerous for the woman than spontaneous labor—even an operative delivery of some difficulty.

15. The sum total of discomfort, distress, malaise associated with cesarean section is as great or greater than the inconveniences and pain of labor; one certainly offsets the other.

16. The above facts, joined to the increased mortality demand that sections shall be done only for clear indications.

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## PREGNANCY IN THE TUBERCULOUS. WITH THE REPORT OF 166 CASES\*

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FROM the earliest medical records to the present time the subject of pregnancy occurring in the tuberculous has attracted attention. Many of the earlier observers believed that pregnancy exerted a favorable influence on the course of tuberculosis. This view was probably due to the fact that gestation tends to increase the weight of the pregnant woman. As early as 1862 Gassner<sup>1</sup> commented upon this finding. De Lee<sup>2</sup> states the increase in weight is the result of increased assimilation of the fetus and its appendages, the storing up of fat and albumin, the accumulation of water and the increase in the amount of blood.

The frequency of pregnancy in the tuberculous is well known. This fact has led some observers to conclude that the sexual appetite is increased in this disease. This, however, is doubtful. The fertility of the tuberculous is probably explainable on other grounds. In 1913 Bacon,<sup>3</sup> estimated that 32,000 tuberculous women became pregnant annually in the United States. At present in the United States alone 65,000 women die annually of tuberculosis.

Pulmonary tuberculosis exerts no influence against conception and except in the end stages does not as a rule produce abortion. Excessive coughing and marked toxemia do in some cases contribute to abortion or premature delivery, but in our series this has not been a marked feature.

As the treatment of tuberculosis in the pregnant woman involves the question of whether or not the pregnancy shall be terminated, three important points must be considered. (1) Does pregnancy act deleteriously upon the course of pulmonary tuberculosis? (2) Does the termination of pregnancy benefit the patient? (3) What will be the condition of the infant if pregnancy is allowed to go to, or nearly to term?

Regarding the first question of whether or not pregnancy acts deleteriously upon the course of tuberculosis, it may be said that a careful analysis of the literature shows an overwhelming opinion in the affirmative. A few isolated opinions to the contrary are on record. In studying this point it should be recognized that it is a question of

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percentages, all patients do not do badly, and a positive opinion should not be based upon the observation of only a few cases.

Furthermore end results should be studied. The majority of reports in this literature are by obstetricians and not by internists. The obstetrician is likely to see the most unfavorable cases. The majority of women are delivered by the general practitioner or midwife and doubtless many mild cases are not recognized, or are treated in the usual manner. If, however, the case does badly it is likely to be referred to a maternity hospital, or consultation is secured, and this to some extent accounts for the fact just mentioned. The following tables represent the results in one hundred and sixty-six (166) cases. In each of these, tuberculosis was positively diagnosed clinically, and the diagnosis in each case was confirmed by the demonstration of the tubercle bacillus. Each case was followed for at least three months subsequent to the termination of the pregnancy and many were observed for a period of years. The majority of these cases are from the Henry Phipps Institute in Philadelphia and constitute the average run of ambulatory patients. The percentage of early cases is probably rather high as all pregnant women applying to our prenatal department are subjected to a thorough examination by an internist especially skilled in the diagnosis of tuberculosis.

TABLE I

RESULT IN 166 CASES OF PULMONARY TUBERCULOSIS COMPLICATED BY PREGNANCY

Each case followed for 3 months after termination of pregnancy		
Total number .....	166	percentage
Pulmonary condition		
Improved .....	30	18
No change .....	62	37
Worse .....	64	38
Deaths* .....	10	6
Pregnancy interrupted (therapeutic abortion) .....	7	3
Premature labor (spontaneous) .....	4	2
Abortion or miscarriage (spontaneous) .....	6	3
Infants stillborn .....	4	2
Infants dead .....	28	16
Infants alive 3 months of age .....	120	72

\*All maternal deaths due to tuberculosis.

The combined statistics of twenty-five authors as found in the Index Medicus from 1915, show that from 50 to 94 per cent of pregnant tuberculous women become worse as a result of their gestation. The combined averages of this large series show that in 64.64 per cent of cases, the pulmonary lesion became worse or ended fatally. In this connection it should be remembered that many of the cases in these series were not followed after the termination of their pregnancy, and if this had been done a greater morbidity and mortality would almost certainly have been observed.

ANALYSIS OF CASE-RECORDS OF 104 WOMEN, 18 TO 38 YEARS OF AGE (INCLUSIVE) NONPREGNANT WITH POSITIVE DIAGNOSIS OF PULMONARY TUBERCULOSIS COMPARED WITH THE PREGNANT SERIES

NON-PREGNANT		PREGNANT	
Cases from the Henry Phipps Institute	Cases from the Prudential Insurance Co. of America	Cases from the Henry Phipps Institute	
Improved .....45.3%	Improved .....43.8%	Improved .....18%	{ 55%
No change .....20%	No change .....24%	No change .....37%	
Worse or dead .....34.7%	Worse .....19.2%	Worse or dead .....44%	
		Dead .....12.5%	
		Entire series 69,500 cases (American and Canadian reference 1909-1919)	

### TABLE III

#### ANALYSIS OF PREGNANT AND NONPREGNANT CASES OF PULMONARY TUBERCULOSIS

NONPREGNANT			PREGNANT		
Phipps Institute in 104 cases			Prudential Ins. Co. in 69,500 cases		
Stage 1	Total	70	Stage 1	Total	68
Improved	32	45%	Improved	18	26%
No change	19	27	No change	29	42
Worse	19	27	Worse	20	29
Deaths	0		Deaths	1	1.5
Stage 2	Total	29	Stage 2	Total	79
Improved	8	27.5%	Improved	11	14%
No change	9	31	No change	35	39
Worse	10	34	Worse	34	43
Deaths	2	6	Deaths	3	3.6
Stage 3	Total	5	Stage 3	Total	19
Improved	1	20%	Improved	1	5%
No change	0		No change	2	15
Worse	1	20	Worse	10	53
Deaths	3	60	Deaths	6	31.5
	104			166	

To determine the actual deleterious action of pregnancy upon the tuberculous woman the foregoing figures should be compared with a series of nonpregnant tuberculous women of similar ages, living under similar conditions and studied for the same period of time. For this purpose we have analyzed one hundred and four (104) cases from the out-patient department of the Henry Phipps Institute with the results shown in Table II.

These tables offer merely general figures. The results of a more careful analysis of our cases, dividing them according to the advancement of the pulmonary condition, when first observed, is shown in Table III.

*Laryngeal Tuberculosis.*—Practically all authors agree regarding the extreme gravity of laryngeal involvement. Five of our one hundred and sixty-six (166) cases developed this complication. Three died and the remaining three were in poor condition when last heard from. Fellner's and Lobenstine's combined statistics report 520 such cases in which the mortality was 65 per cent.

From the study of these numerous large series of cases of pregnancy in the tuberculous, it seems hardly possible for the unbiased observer not to be impressed with the fact that pregnancy exerts a deleterious influence upon a considerable proportion of cases. This being the case, our second question of what benefits may be hoped for by the termination of the gestation, becomes of importance. Medical opinion varies largely upon this point and many factors must be taken into consideration. In our series, therapeutic abortion has been performed seven times, too small a number from which to draw conclusions.

On the other hand the study of the remaining cases is of value. In the entire series 20 appeared improved and 62 exhibited no marked change as a result of their pregnancy, thus 49 per cent were no worse off after the pregnancy. A study of 674 cases collected from the literature (Funk,<sup>5</sup> McSweeney,<sup>6</sup> Mosher,<sup>7</sup> Nobecourt,<sup>8</sup> Sachse,<sup>9</sup> and Walsh<sup>10</sup>) shows that no operative intervention was practiced in 630 and therapeutic abortion was resorted to in 44. Deterioration without operative intervention was observed in 44 per cent as against deterioration with operation in 9 per cent.

*Infant Mortality.*—Whether or not the infants of tuberculous mothers are constitutional weaklings or whether they exhibit a hypersusceptibility to tuberculosis is not definitely settled. The weights of all the infants from our series are not available, but such as have been studied do not show a marked decrease from the average. The author has observed large, fat, apparently healthy infants born of mothers in the last stages of the disease. It is probable, however, that in a large series of cases the infants would be found to weigh slightly less than the average and to be less vigorous, as would a

series from mothers whose health was depleted from any other chronic wasting disease. In a series of over 1500 infants collected from the literature by fourteen authors, the infant mortality was 58.83 per cent. Doubtless invalidism on the part of the mothers, or an actual motherless condition, bottle feeding and operative intervention during labor, greatly influence the mortality. In our own series of 166 cases 120 infants were alive three months or more after delivery, showing an infant mortality of 27.7 per cent.

*Congenital Tuberculosis* is so rare that it may be regarded as a medical curiosity. A careful search through the literature shows but 13 positive cases.<sup>4</sup> Tubercle bacilli in the placenta and actual placental tuberculosis are less rare, but are still so infrequent as to be almost negligible factors. The relatively high percentage of tuberculosis which has been observed in the children of tuberculous parents is the result of postnatal infection and can be prevented by proper prophylactic measures.

Some of the material utilized in this report has been previously employed by one of the authors. In a further study of our cases we have not changed our opinion regarding their treatment. We believe that had pregnancy been terminated early, in a greater proportion of cases the results would have been better. Some of our patients refused operation and others came to us too late to benefit by such treatment. In our work we have perhaps erred on the side of conservation, but taken as a whole believe the results compare favorably with those reported by other authors. In conclusion the authors wish to take this opportunity to extend thanks to the medical staff of the Henry Phipps Institute, especially to Dr. H. R. M. Landis and Dr. Isadore Kaufman, as well as to the efficient work of the Social Service department of the same institution. The intelligent work of the latter has been the means of saving many infants.

#### CONCLUSIONS

1. The combination of pregnancy and pulmonary tuberculosis is a common one.
2. Pulmonary tuberculosis exerts little or no influence against conception.
3. Pulmonary tuberculosis exerts but little influence on the course of pregnancy, and except in the advanced stages exerts little or no influence toward causing abortion, miscarriage, or premature labor.
4. About 20 to 30 per cent of mild, quiescent pulmonary tuberculosis and 70 to 90 per cent of more advanced cases exhibit exacerbations during pregnancy or the puerperium.
5. Marriage is worse for the tuberculous woman than for the tuberculous man owing to the dangers incident to pregnancy.

6. Unless the pulmonary lesions have been quiescent for a moderately prolonged period, tuberculous women should not marry.

7. Tuberculous women should not become pregnant unless the disease is in the first stage, and has been quiescent for a minimum period of two years.

8. It is as yet impossible to determine with certainty which case will bear the added strain of pregnancy well and which badly. We must individualize our patients. Moderately extensive lesions, extension, especially laryngeal involvement, loss of weight, fever, hemorrhage, sweats, lack of vigor, inability to obtain proper treatment are ill omens, whereas the reverse are more favorable.

9. Prior to the fifth month of pregnancy, the uterus should be emptied if the disease manifests any evidence of becoming active. Curettage during the first six or eight weeks, and in the latter cases vaginal hysterotomy are the preferable methods. Regarding the latter method, while it is preferable from an operative standpoint, it must be remembered that abortion can be induced without a general anesthetic, whereas one is usually required if a vaginal hysterotomy is performed and sometimes the latter fact will outweigh the advantages of the former.

10. About 65 to 70 per cent of suitable cases will be benefited by this treatment provided it is employed as soon as acute symptoms arise and provided that proper after-treatment is instituted. Late intervention, that is, after a week or more from the onset of the exacerbation, has given less satisfactory results.

11. Sterilization is not justifiable as a routine procedure. Here again the patients should be individualized. Furthermore as a routine procedure it is not advisable as in many cases it will be more expedient to empty the uterus without an anesthetic. Sterilization involves opening the peritoneal cavity and usually requires a general anesthetic. Apart from the dangers of a general anesthetic, sterilization prolongs the operation and generally adds to the gravity of the same. If the case is in such a condition that she is going to do badly it is useless. If as a result of emptying the uterus she improves, it is better to perform the sterilization at a later date when she is in better condition.

12. After the fifth month of pregnancy, it is generally advisable to treat these patients expectantly. Labor should be made as easy as possible. For this end, induction of premature labor two weeks before term may be advisable, rarely, if ever, should they be allowed to go beyond term. At labor, forceps or version is often indicated.

13. Infants should not nurse from tuberculous mothers, and should be especially guarded from infection.

14. Hygienic and dietary treatment should be employed at all

times. These patients should be kept under close observation and should be examined by a competent internist at regular and frequent intervals.

15. In the great majority of cases the tuberculosis precedes the pregnancy. Even in those cases in which the symptoms are first observed during pregnancy, infection has generally occurred prior to conception and an exacerbation during pregnancy has directed attention to the pulmonary condition.

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(For discussion, see p. 668.)

### FURTHER EXPERIENCE WITH PITUITARY EXTRACT IN THE INDUCTION OF LABOR\*

BY B. P. WATSON, M.D., F.R.C.S.E., F.A.C.S., TORONTO, ONT.

TWO years ago I presented to this Society a communication† in which I gave an analysis of one hundred and fifty cases of induction of labor, in the majority of which pituitary extract had been the inducing agent. Since then we have had a larger series of cases the results of which I now wish to record.

As in the first series of cases already recorded we have used quinine and pituitary extract as the routine method of induction in the majority of cases, but sometimes quinine alone has been sufficient and in a considerable number pituitary alone has been used. Our routine procedure in the public wards is as follows:

- |                        |          |             |
|------------------------|----------|-------------|
| 1. Castor oil          | oz. i at | 6 p.m.      |
| 2. Quinine hydrochlor. | grs. x " | 7 p.m.      |
| 3. Enema               | " "      | 8 p.m.      |
| 4. Quinine hydrochlor. | grs. x " | 9 p.m.      |
| 5. " "                 | " x "    | 12 midnight |

If labor pains do not begin by 9 A.M., i.e., 14 hours after the first dose of quinine, pituitary extract  $\frac{1}{2}$  c.c. is given intramuscularly. If labor pains begin, no further dose is given, but if there is no result or if the pains initiated by the drug begin to pass off the pituitary extract is repeated in half an hour. Further doses at half hour inter-

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†Transactions of the American Gynecological Society, 1920. Abst. in *Am. Jour. Obst. and Gynec.*, i, No. 1, 70.

vals are given, up to a total of six doses if necessary. If labor is not then definitely begun treatment is stopped and a similar attempt with pituitary is made the next day and if necessary the day after that.

Where pituitary extract alone is used the routine is as follows:

1. Enemata till the rectum is clear at 6 A.M.
2. Pituitary in  $\frac{1}{2}$  c.c. doses as above, beginning at 7 A.M.

In cases where we have failed to induce labor by these means we have used bags or bougies and in a few instances have used these as the initial procedure.

Since my last communication we have had a series of 128 cases of attempted induction in the public wards of the Toronto General Hospital. I have had 54 in private practice, and Dr. W. A. Scott, a member of my Staff, has had 94 in his practice. The results of these he has kindly placed at my disposal. He has used the same method as above outlined. This gives a total of 276 cases.

The indications for induction in these cases were as follows:

Pregnancy prolonged beyond term.....	154
Pregnancy toxemia and eclampsia.....	51
Small pelvis or large child .....	38
Distress or discomfort before or at term.....	30
Antepartum hemorrhage.....	10
Glycosuria .....	2
Asthma .....	1

It will be noted that the chief indication has been postmaturity. We believe that, when a pregnancy has continued more than ten days or two weeks beyond the calculated date of labor, induction is indicated. We do not hesitate to use pituitary extract in cases of pregnancy toxemia with high blood pressure, as Dr. W. W. Lailey, a member of my Staff, carried out a series of observations and found that the blood pressure was never raised more than five points by a single dose of pituitary extract and that subsequent doses did not raise it any higher. We have frequently used it to start labor in the presence of actual convulsions. A word may be said about the fourth indication—distress or discomfort shortly before or at term. These patients had abdominal pain, backache and inability to walk, sleeplessness and general malaise lasting over several weeks. Such cases are not uncommon in obstetrical practice.

Of the ten cases of antepartum bleeding four were placenta previa and six were cases where there was very slight bleeding without abdominal pain or uterine tenderness, with the placenta in its normal position.

The following table gives the results of the different forms of induction:

## METHOD OF INDUCTION

	TOTAL CASES	NO. OF FAILURES	PER CENT OF SUCCESSSES
Castor Oil and Quinine	55	*	
Castor Oil, Quinine and Pituitary	130	13	90
Pituitary alone	65	6	90.7
Bags and Bougies	33†	2	93.9

\*These were all successful, but in the 130 cases where pituitary had to be used there was no result from the quinine alone.

†In seven of these quinine and pituitary had previously failed.

It will be seen from the above table that out of a total of 195 cases in which a combination of quinine and pituitary or pituitary alone was used, labor was successfully induced in 176 or 90 per cent.

In 146 cases or 75 per cent, labor began as the result of one routine induction, the average number of doses of pituitary extract each patient received being 3.2. There remained 49 patients in whom labor did not begin. In eight of these no further attempt at induction was made, leaving 41 who underwent a second routine induction with pituitary extract. In 23 of these or 56 per cent, the second attempt was successful, the average number of doses of pituitary extract being 2.8. In 5 of the 18 unsuccessful cases no further attempt at induction was made, leaving 13 who underwent a third routine induction with pituitary extract. In 10 of these or 77 per cent, this third attempt was successful, the average number of doses of pituitary extract being 3. In 49 of the cases the induction was carried out at from four weeks to one week before term. In these premature cases the number of successes was 37 or 75.5 per cent, showing, as we would expect, that induction is more difficult before than at or after term.

## MATERNAL COMPLICATIONS

In the series of cases recorded there were no maternal deaths. In two cases, both elderly primiparae, there was considerable shock following the third stage with an excessive amount of hemorrhage. Both required stimulation and saline interstitially, but made good recoveries. Both labors lasted about twenty hours and were completed by forceps. Pituitary as a possible cause of the condition cannot be excluded, but it is one which we have all met with in cases where pituitary has not been used.

In one case the first dose of pituitary set up severe vomiting and the induction was not proceeded with further.

All patients were examined vaginally from ten days to two weeks following delivery and in none was there any laceration of the cervix of such degree as to demand repair.

In two cases there was retention of the placenta in the third stage. Both required manual separation and extraction. They both had more hemorrhage than usual, but made good recoveries. In one case severe



hemorrhage followed the first dose and revealed a central placenta previa hitherto unsuspected. She was delivered immediately by cesarean section.

#### INFANT MORTALITY

In the series of 195 cases in which pituitary extract was used there were ten stillbirths and two children died within three days of delivery. This gives a fetal mortality of just over 6 per cent. The general fetal mortality for all cases in the hospital for the past six months is 6.5 per cent. The causes of fetal death were as follows:

Hydrocephalus .....	2
Anencephaly .....	1
Atelectasis .....	2
Cerebral hemorrhage .....	3
Eclamptic toxemia .....	2
No autopsy .....	2

The cases of hydrocephalus and anencephaly call for no comment. One of the cases of atelectasis was a child presenting by the breech and delivered with difficulty. It died on the third day. The other was born after a slow labor in a very stout primipara who had gone two weeks past term. It died twenty-eight hours after birth.

One of the three cases of cerebral hemorrhage was in a child delivered by the breech. One was delivered by low forceps. The labor in this case was induced two weeks before term on account of severe glycosuria in the mother which was unaffected by treatment, but which cleared up after delivery. The remaining case of cerebral hemorrhage was a child born after an easy labor.

In the two cases of stillbirth ascribed to pregnancy toxemia the children had died *in utero*, one 48 hours and the other three days before delivery. In both cases two attempts to induce labor with quinine and pituitary had been made prior to the death of the children. In one case labor was ultimately induced with bougies and in the other a further two doses of pituitary extract were successful. In both cases the placentae were much infarcted. Possibly both these children might have been saved had the first induction been successful or bags used as soon as the failure of pituitary became apparent. These were the only two children lost in 51 cases of toxemia which underwent induction.

To sum up, in the 195 cases of induction of labor in which pituitary extract was used as the inducing agent 90 per cent were successful. The maternal mortality was nil. There were no cases of laceration of the cervix and no greater proportion of pelvic floor lacerations than in ordinary labor. There were two cases of retained placenta and two cases of rather severe hemorrhage accompanied by shock follow-

ing the birth of the placenta. Both of the latter were primiparae over 39 years of age. I submit that the number and nature of these complications is no greater than would be met with in a like number of deliveries where no pituitary had been used.

There were 12 fetal deaths, giving a fetal death rate of just over 6 per cent. Three of these children were monsters. Two died in utero apparently from placental infarction due to pregnancy toxemia. Three died of cerebral hemorrhage, two died of atelectasis within three days of birth and in two no autopsy could be obtained to ascertain the cause of death. Taking into consideration the nature of the cases in which induction was carried out I think that the results so far as fetal death rate is concerned compare favorably with those obtained by any other procedure.

A great deal has been said and written about the bad effects on the mother resulting from the administration of pituitary extract in the course of labor. I am convinced that practically all of these are the result of the wrong administration of the drug. Pituitary extract should be used in the course of labor for one purpose and one purpose only, viz., to stimulate uterine contraction when this is markedly inadequate and where we are absolutely satisfied that given adequate contraction there is no possible obstruction to the passage of the child. To give pituitary to a patient with a rigid cervix or in a case of delay due to a small pelvis, large head, malposition of the head or rigid pelvic floor is to court disaster. Cases of rupture of the uterus and fetal death are bound to occur if it is used in such cases, but this is no argument against its use in the properly selected cases.

When given to induce labor the initial dose is  $\frac{1}{2}$  c.c. If there is any idiosyncrasy on the part of the patient to the drug it is revealed at once as in the case cited where severe vomiting resulted. Administration can then be stopped. Our experience shows that if the first dose produces no bad effects subsequent doses will be equally well borne as the drug has no accumulative effect. In our experience the initial contractions induced have never been of a severe tonic nature. The first contraction is usually longer than the succeeding ones, but these latter are of the nature of ordinary labor pains. In most cases these begin to die away in fifteen or twenty minutes and must be kept going by a further dose. If contractions can be kept up sufficiently long, if necessary by further doses, to start dilatation of the cervix and separation of the lower pole of membranes, the labor will thereafter go on naturally.

There is only one specific criticism of the method which I shall mention, viz., that contained in the Practical Medicine Series for 1921. There, the Editor, after reviewing my first communication states that

he "believes it more than possible that a man could recover damages at law for the loss of wife or child, if it were shown that pituitrin was administered before delivery." That, I hold is not a fair criticism. It is a statement which may involve many practitioners in costly law suits and is certainly not calculated to stimulate research along new lines in medicine.

(For discussion, see p. 660.)

## THE ACTION OF ERGOT AND SOLUTION OF HYPOPHYSIS ON THE UTERUS\*

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PROBABLY from observing the effects in the epidemics of ergot poisoning which were formerly so common in Russia and Germany, the uterine action of the drug was discovered many years ago. This action must have been utilized clinically at some very early date; mention appears to have been first made of it by Lonicer<sup>1</sup> in 1565; but the utilization of ergot in obstetrics by members of the regular medical profession may be said to have begun with the appearance of Stearns' letter in 1808. Stearns<sup>2</sup> and many of his immediate successors in the advocacy of the use of the drug, recommended that ergot be employed, both to check or prevent postpartum hemorrhage and also to increase the force of the uterine contractions in the early stages of labor. Ryan,<sup>3</sup> in 1831, expressed the view widely held at that time when he said of ergot: "In small quantities, it is a safe and valuable remedy, and has a specific effect on the uterus, exciting gradual but powerful contractions of that organ when the natural parturient action is diminished or has entirely ceased. It does not produce permanent contraction, but merely renews the labor pains and augments their force \* \* \* (it) abridges human suffering which might continue hours and days unalleviated; it supersedes the use of instruments in many cases; and it saves the attendant much anxiety and useless loss of time." As late as 1882,<sup>4</sup> it appears that ergot was still used extensively to increase the force of uterine contractions during the early stages of labor; and, indeed, in one of the best of the modern text books on pharmacology<sup>5</sup> such use seems still sanctioned. The general consensus of opinion today among intelligent and conscientious obstetricians, however, is that ergot should never be administered before the expulsion of the placenta. As a conse-

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quence of a century's trial by the medical profession, the conclusion has been reached that ergot is an unsafe drug to employ in the early stages of labor. "The firm contraction may hinder delivery and compress and asphyxiate the fetus; even rupture of the uterus has been reported." That such results always follow the use of ergot is a ridiculous assumption; their absence in the wide experience of men like Ryan and Dewees<sup>6</sup> disproves it; but because such disasters may occur, the early administration of ergot has rightly been abandoned.

Following the demonstration of the action of the extract of the posterior lobe of the pituitary gland on the uterus of lower animals, Bell,<sup>7</sup> in 1909, suggested its use to stimulate the contractions of the human uterus. In certain sections of the country this drug enjoys an enormous popularity; many practitioners employing it as a routine in their obstetrical practice. Those enthusiasts<sup>8</sup> who recommend the administration of pituitary extract in the early stages of labor contend that its action is essentially different from that of ergot; the latter drug may occasionally lead to a tetanic contraction of the uterus with the baneful results that have been mentioned, but pituitary extract, while increasing the force of the individual contractions, does not disturb the normal relationship between relaxation and contraction. It is difficult, to say the least, to obtain positive evidence in support of this contention; probably it is based on "clinical impressions" similar to those which led Ryan to make the same statements in regard to ergot. Elsewhere<sup>9</sup> we have shown that pituitary extract, even in minimum doses, may cause an increase in the tonicity of the human uterus which, in its effect on intrauterine pressure, is identical with that produced by a tetanus. In the present paper the results of a more extended comparison of the action of ergot and pituitary extract on the uterus, both of lower animals and of women, are reported.

The preparations used have been solutions of the posterior lobe of the pituitary gland of four different manufacturers, three fluidextracts of ergot of three different manufacturers, and two special preparations of ergot. All of the samples of pituitary solution were of recent date of manufacture, had been assayed physiologically, and appeared to be of about the same strength, as judged by their effects on the isolated uterus. Two of the fluidextracts of ergot and the special preparation were also fresh preparations; the third sample of the fluidextract was at least four years old, having been in the laboratory for that length of time. All of these ergot preparations, as will be shown in the tracings, were capable of causing contraction of the uterus of lower animals when administered in sufficient dose; as judged by the uterine effect, there was no striking difference in the efficiency of the oldest and the newest, although we

found it practically impossible to establish definite quantitative relationship between the different preparations, a difficulty that Edmunds and Hale<sup>10</sup> have already mentioned in connection with the uterus method for the assay of ergot.

In the laboratory experiments, cats and dogs were utilized. The drugs were tested on the excised uterus and also on the organ *in situ*. The excised uterus was suspended in warm, oxygenated Tyrode's solution; after securing a normal record, Tyrode's solution containing a definite concentration of the drugs was introduced. For the experiments on the organ *in situ*, the animals were decerebrated and given artificial respiration; the uterine movements were recorded by the method of Barbour.<sup>11</sup>

The official dose of the fluidextract of ergot is 2 c.c.; that of the solution of hypophysis, 1 c.c. Of late, however, the tendency has been to administer the latter drug in a dose of  $\frac{1}{2}$  c.c. or even less. The attempt was first made to compare the action of ergot and pituitary solution in this latter ratio; namely, 4 to 1 although it is probable that, clinically, ergot administered orally attains a less concentration in the blood than the smaller dose of pituitary solution administered intramuscularly or intravenously.

The first step was to ascertain the dose of the ergot which was capable of causing a tetanic contraction or a marked increase in the tone of the uterine muscle. It was found practically impossible to fix on any definite concentration or dose, because of the difference in the response of the uteri of different animals of the same species. As a rule, the intravenous injection of approximately the clinical dose, 0.04 c.c. per kilogram or a concentration of 1 to 10,000 did not uniformly have striking or persistent effects. For the intact uterus, it was necessary to use a dose of 0.1 c.c. per kilogram; and for the excised uterus, 1 to 1,000 produced the most desirable action. The tracings in Fig. 1 illustrate the tetanic action of ergot on the cat's uterus *in situ*; while Fig. 2 shows a similar action on the uterus of a dog, *in situ*. Fig. 3 shows the effect of pituitary solution both upon the uterus and upon the blood pressure.

Decided effects were more easily elicited by pituitary solution. Thus, Fig. 4 illustrates the effect following the intravenous injection of 0.01 c.c. of pituitary solution per kilogram into a non-pregnant cat. In this animal the intravenous injection of 0.04 c.c. of fluidextract of ergot per kilogram produced only slight effects, the increase in tone passing off in 4.5 minutes after the first preparation and 6.25 minutes after the second; while after the injection of a fourth of this dose of a solution of pituitary, there was an enormous increase in tone, which persisted to the termination of the experiment some thirty minutes later. It is possible that the previous ergot injections

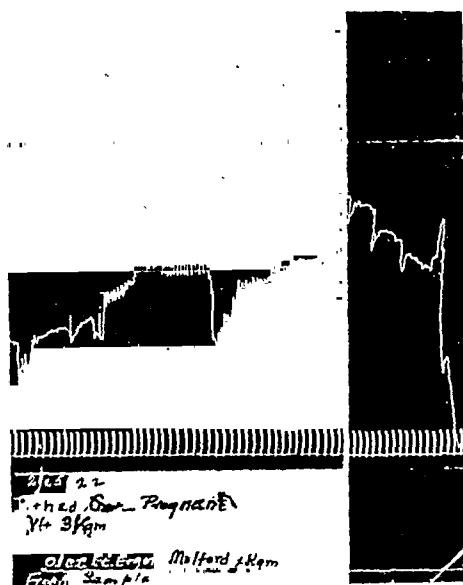


Fig. 1.—Pregnant cat; pithed. Persistent increase in tone-tetanus following the injection of 0.1 c.c. of fl. ext. ergot per kilogram. Uterus did not relax until more than fifteen minutes elapsed after injection. Note the large dose necessary to produce this effect. Time intervals, five seconds.

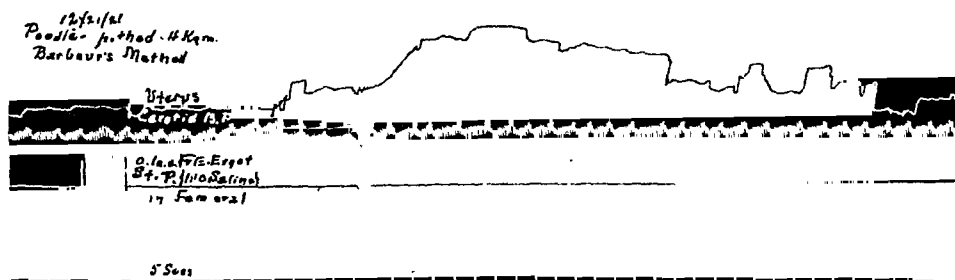


Fig. 2.—Nonpregnant dog. Record of blood pressure and uterine contractions. Injection of 0.1 c.c. of fl. ext. ergot per kilogram caused a tetanus of the uterus persisting 3.6 minutes. Slight rise in blood pressure.

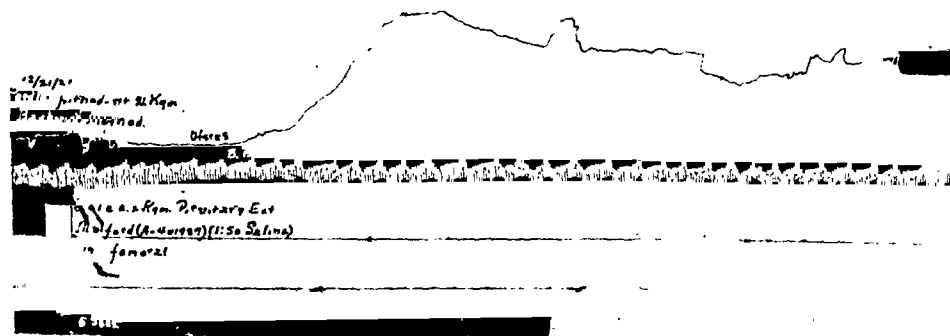


Fig. 3.—Nonpregnant dog, pithed. Injection of 0.01 c.c. pituitary solution, caused a tetanus which persisted 35 minutes, when the experiment was discontinued. Little effect on blood-pressure.

sensitized the uterus to the later action of the pituitary, Edmunds and Hale<sup>10</sup> having noted an increasing irritability of the uterine muscle as a persistent effect of ergot injections. In the experiment illustrated

in Fig. 5, the order of injection was reversed, the pituitary solution being injected first, with the result that there was a marked increase in tone, persisting four minutes; while the subsequent injection of a thirty-two times larger dose of fluidextract of ergot caused a much smaller contraction, which passed off completely in three and one-half minutes. In one tracing are recorded the effects obtained simultaneously on the uterus of a cat *in situ* and a small portion of the uterus of the same animal excised. The larger dose of the ergot preparation caused less effect in both instances. In a nonpregnant dog, successive injections of a sample of fluidextract of ergot and one of pituitary solution were made. The ergot was given in a dose of 0.1 c.c. per kilogram; the dose of the pituitary solution was one-tenth this size. The increased tonus following the ergot injection persisted 6.25 minutes; the greater increase in contraction produced by the pituitary solution persisted over thirty minutes. In the tracing obtained from the intact

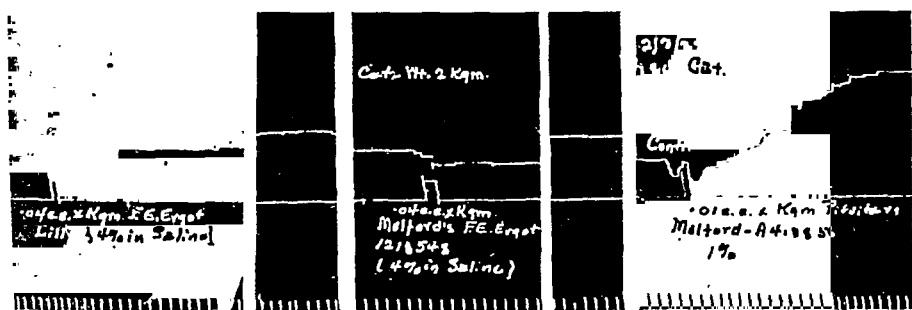


Fig. 4.—Pithed cat; nonpregnant. First injection of Lilly's fl. ext. ergot. Resulting maximum of contraction reached in 4.5 minutes, next injection of the same dose, i.e., 0.04 c.c. per kilogram. Mulford's fl. ext. ergot; resulting maximum contraction reached in 6.25 minutes. Last injection, 0.01 c.c. pituitary solution; contraction maintained 35 minutes.

uterus of a pregnant cat, the small dose of 0.5 c.c. of a 1:400 pituitary solution caused more striking and persistent effect than fluid extract of ergot in thirty-two times this dose. A segment of dog's uterus suspended in Tyrode's solution containing pituitary solution in the proportion of 1:2000, contracted more markedly than it did in the fluid extract of ergot in twenty times more concentrated solution.

From these experiments, it seems fairly safe to conclude that pituitary solution affects the uterus of cats and dogs more powerfully than ergot does. Instead of being devoid of the tetanizing action manifested by ergot, pituitary solution seems more prone to produce either a tetanus or an increase in tone which is similar in regard to its effect on intrauterine pressure. The indication is, therefore, that pituitary solution, instead of being safer than ergot when employed in the early stages of labor is actually more dangerous.

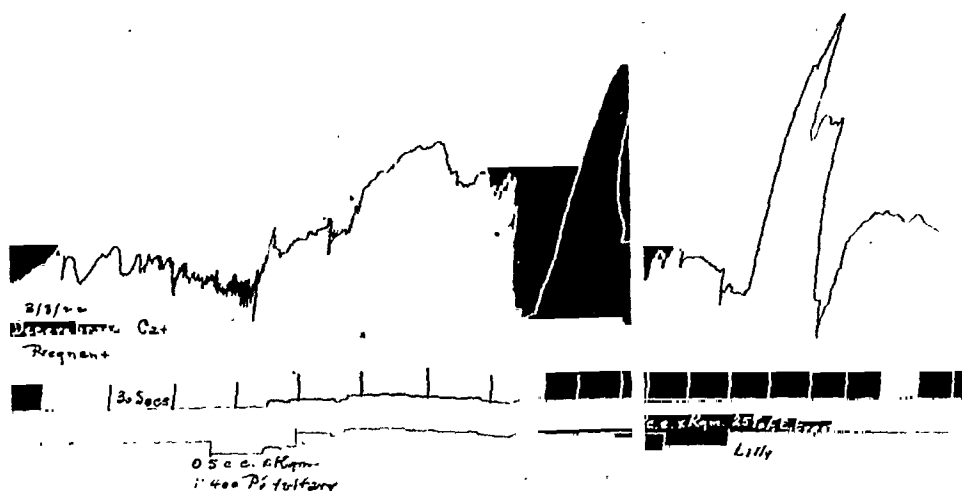


Fig. 5.—Pregnant cat, decerebrated. Time intervals 30 seconds. One-half c.c. of 1:400 pituitary solution per kilogram caused a much more pronounced effect than 32 times this dose of fl. ext. ergot. The pituitary effect persisted 4 minutes, that of ergot 3.5 minutes.

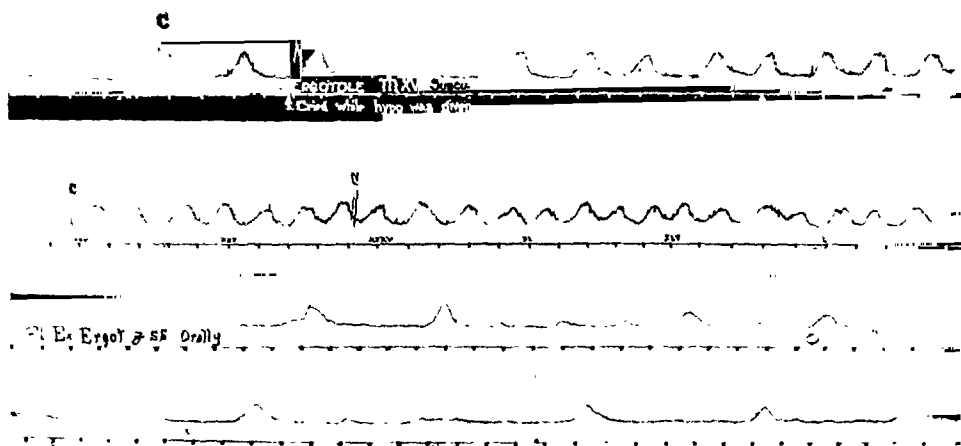


Fig. 6.—Patient at term and in first stage. In this and all subsequent records the timer marks minutes. Ergotole, 1 c.c. given at the point marked by arrow. Patient cried out at the prick of the needle and the consequent rise in intrauterine pressure shows on the record as an abrupt rise and fall in contrast to the regular rhythmic wave-like uterine contractions. The lines marked "c" are the result of an occasional cough. Note that after 20 minutes there was an increase in the rhythm, but there is a return to the base line after each contraction. The two tracings below are the records of another patient at term. She was given 2 c.c. of fl. ext. ergot with no demonstrable effect.

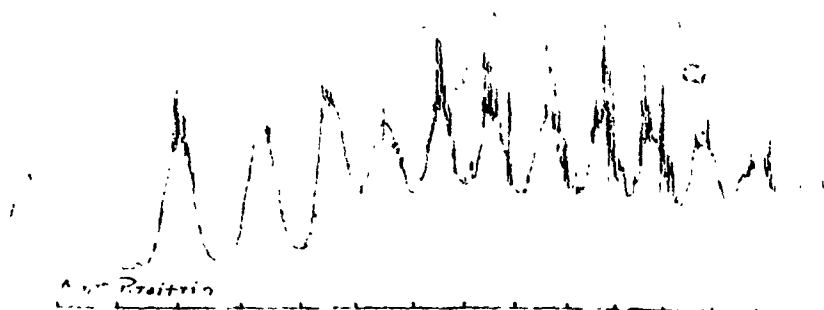


Fig. 7.—This patient was at term and late in the first stage. Pituitrin 0.12 c.c. hypodermically. In two minutes partial tetanus with superimposed waves of contraction. Perpendicular lines at the acme of pains are due to the straining action of the abdominal muscles.



There are some, however, who will advance the argument that results obtained on lower animals cannot be used as a basis for drawing clinical conclusions. The most direct answer to this argument is the presentation of clinical evidence in support of the statement that the human uterus is also affected as powerfully by pituitary solution as it is by ergot. In the paper already referred to,<sup>9</sup> such evidence has been presented. In the earlier experiments, records of contractions of the human uterus were obtained by means of inserting a Voorhees bag into the cervical canal and connecting the bag with a mercurial manometer. Since it was possible to secure such records only during the first stage of labor, it was necessary to proceed with the utmost caution, using only very small doses in nearly all the cases. Later, by the utilization of the method of "external hysterography" suggested by Rübssamen,<sup>12</sup> we have been able to secure records of

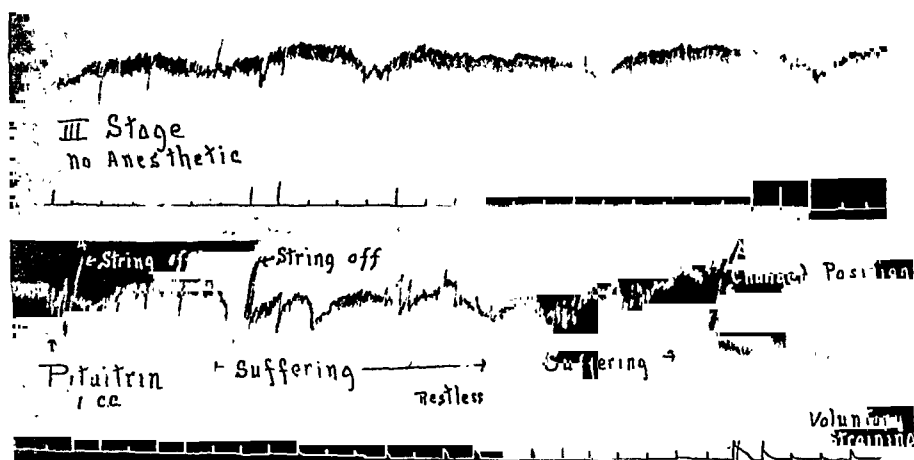


Fig. 8.—Tracing obtained in the third stage by Rübssamen's method. Down strokes represent contractions, respiratory movements straight up-and-down lines, and the uterine contractions by broader waves every 7 or 8 minutes. Patient given 1 c.c. of pituitrin. Her struggles against the hypodermic threw the thread off the pulley. Six minutes after the injection marked contraction of the uterus and complain of pain. This persisted for 9½ minutes and after a quiescent period of two minutes recurred for 5 minutes, but with less intensity. A indicates artifacts caused by the threads slipping off.

uterine contraction in the third stage of labor and after the expulsion of the placenta. All of the women were at term.

Fig. 6 shows the most marked effect of ergot preparations that we have been able to obtain in the first stage of labor. In the upper tracing, 1 c.c. ergotole was injected hypodermically at the point marked "T" and in the lower tracing, 3.75 c.c. of the fluidextract was given by mouth at the indicated time.

In our former work, the use of pituitary extract even in minute doses so uniformly produced partial tetanus, that we have not felt justified in repeating this work. For the sake of comparison, however, we wish to show one of our former tracings (Fig. 7). This was made by injecting hypodermically a multipara at term with 0.12 c.c. of

pituitrin. The latent period was scarcely two minutes and the uterus remained continuously contracted with superimposed waves of contraction for a period of 28 minutes.

In the tracings made by Rübsamen's method, down strokes represent contractions. A change in the height of the record above the base line does not represent a change in tone as might be thought at a cursory glance, but means a slight shifting of the patient's position. Rübsamen used kidney pads to immobilize the patients, but in our work we have simplified the apparatus as much as possible in order to enable us to set it up quickly after the birth of the baby. Fig. 8 shows the effect of injecting 1 c.c. of pituitrin hypodermically in the third stage of labor. Six minutes after the injection, there was a marked contraction of the uterus and the patient complained of

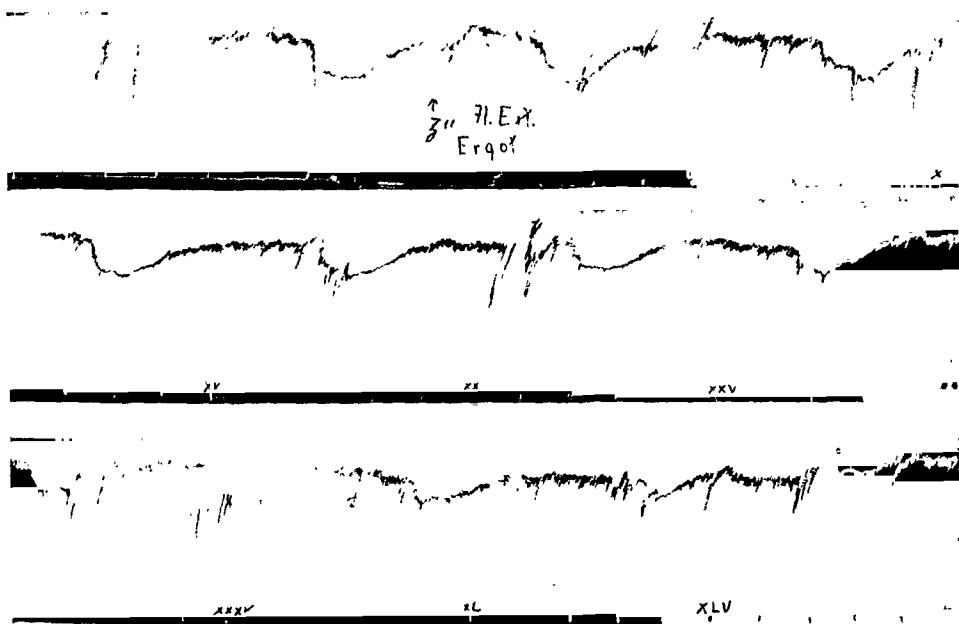


Fig. 9.—Record obtained shortly after the third stage. Fl. ext. ergot, 7.5 c.c., was given by mouth, with very little effect except a slight shortening of the interval between afterpains and an increased suffering on the part of the patient.

pain. This persisted for nine and a half minutes, and after a quiescent period of two minutes, recurred for five minutes, but with less intensity. The patient expelled the placenta by voluntary effort at the end of the record. When fluid extract of ergot 3.75 c.c. was given in the third stage, there was no demonstrable effect other than a slight diminution of the respiratory movements thirteen minutes after and again sixteen minutes afterwards.

The best time to study uterine contractions by "external hysterography," is just after the completion of the third stage of labor. The patient is well content to lie perfectly still, except possibly when she has an afterpain, and there are none of the necessary disturbances of the third stage, such as delivering the afterbirth, repairing lacerations.

tions, etc. It is at this time that ergot is most generally used, and here too, it is generally conceded, lies a field of usefulness for pituitary substance. We have found that only multiparae are useful for demonstrating the action of these drugs for the reason that in primiparae the uterus remains firmly contracted and only the respiratory movements show on the records. Fig. 9 is a record obtained shortly after the third stage. This multipara was having afterpains approx-

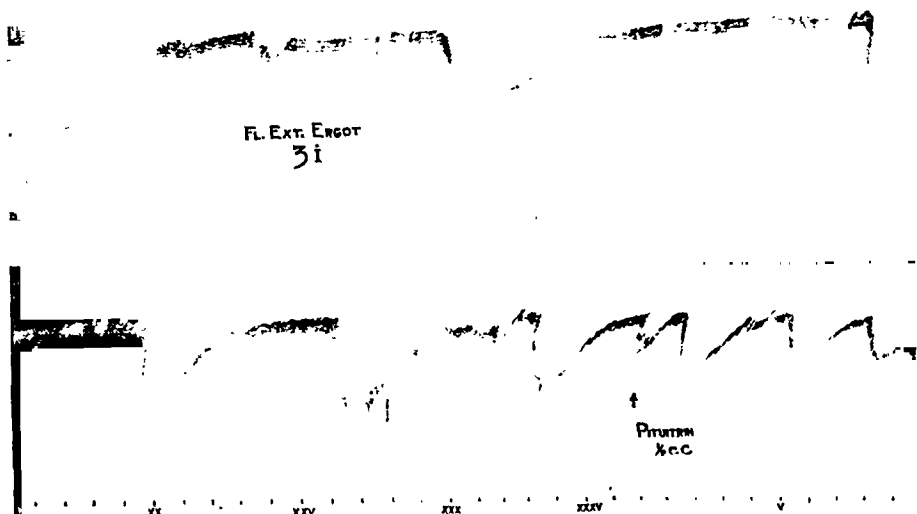


Fig. 10.—Postpartum record. Patient given first 3.75 c.c. fl. ext. ergot by mouth and later 1 c.c. pituitrin hypodermically. Ergot seemed to cause a moderate increase in the frequency of the contractions while after the pituitrin they came in rapid succession.

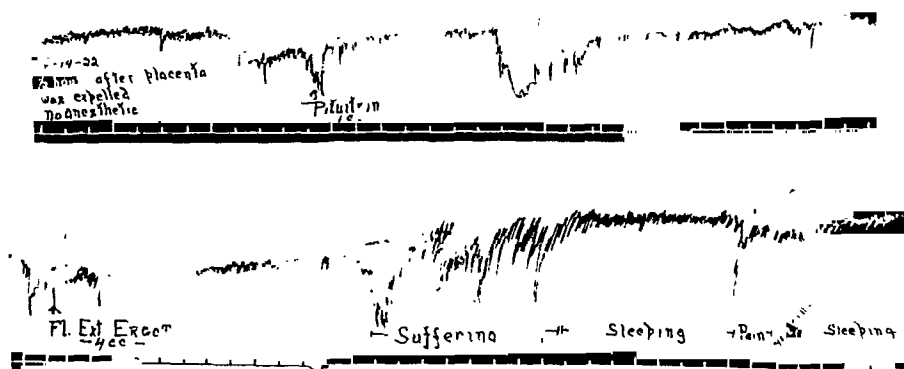


Fig. 11.—Postpartum record. Patient was given first pituitrin and then fl. ext. ergot. Depression three minutes before the pituitrin was given is caused by the patient shifting her position. The latent period of the pituitrin 8 minutes, contraction lasted 5 minutes. Latent period for ergot was 13 minutes and resultant contraction lasted 8 minutes.

imately every five minutes. She was given 7.5 c.c. of the fluidextract of ergot with very little effect except a slight shortening of the interval between pains and increased suffering on the part of the patient. Fig. 10 is another postpartum record upon a multipara. This patient was given first 3.75 c.c. of the fluidextract of ergot by mouth and

later 1 c.c. of pituitrin subcutaneously. The ergot seemed to cause a moderate increase in the frequency of contractions, while after the pituitrin the contractions came in rapid succession. In Fig. 11 the order of administration was reversed. The latent period here was eight minutes for the pituitrin and the contraction lasted five minutes. The latent period for the ergot was thirteen minutes and the resultant contraction lasted eight minutes.

#### COMMENT

In no case by the use of ergot did we elicit tetanic contractions of the uterus in human beings in the first stage of labor. This is at such a variance with what the accumulated clinical experience of a hundred years has led us to expect that we were at a loss how to interpret our results. At first, we were inclined to the supposition that the drugs used were inert, but this we disproved: first, by testing the same drugs upon animals, and second, by getting practically the same results with other lots of ergot. It is likely that there is a great deal of variation in the response of human uteri to both ergot and pituitary solution, and that the occasional existence of a uterus highly sensitive to these drugs accounts for the disastrous results that have followed their use. We have encountered such uteri not infrequently in our work with animals. Another explanation that may account for a certain number of cases is the sensitization of the uterus by repeated doses of ergot as was noticed by Edmunds and Hale. We have seen no such phenomenon in our observations upon human beings. In the laboratory, however, we have noticed a great variability in the response of the same uterus, the response sometimes being increased and sometimes being diminished by repeated doses of ergot.

Next to the ease and promptness with which a tetanic contraction of the uterus is elicited by pituitary solution, the most interesting feature of the action of this drug is the variation of the latent period. It has often been noted clinically that the effect of the solution of the hypophysis has been the more prompt and energetic, the closer the patient was to term. This has been borne out by our observations. When it has been necessary to induce labor in the seventh month, the latent period was four minutes, while at term we found it to be two minutes. In the third stage six minutes elapsed after the injection of the liquid before a response was noted, while after the delivery of the placenta, the latent period was found to be eight minutes.

#### CONCLUSIONS

It can be readily demonstrated by animal experimentation that the action of ergot and hypophysis solution upon the uterus are the same if large enough doses of ergot are used.

The action of pituitary preparations is much more powerful than that of ergot. This is readily shown both by experiments upon animals and by accurate observations upon human beings.

The action of both drugs varies greatly with different individuals. This is a common clinical experience and is abundantly substantiated by laboratory experiments.

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(For discussion, see p. 660.)

# INTRAUTERINE RUPTURE OF A VELAMENTOUS UMBILICAL CORD\*

BY GEO. W. KOSMAK, M.D., NEW YORK, N. Y.

THERE is no gainsaying the fact that improvement in obstetrical methods and procedures has largely diminished maternal morbidity and mortality. Any one whose obstetrical experiences extend back over a period of twenty years can bear personal witness to the reduction in the number of serious obstetrical complications that are referred to a hospital for final delivery or treatment or are met with in consultation practice. But there is still a large group of fetal anomalies before which the obstetrician stands helpless. This includes mainly those accidents associated with fetal growth and development that cannot be detected in advance by any known methods that would result in the saving of the life of the child. Among these, attention may be directed to anomalies of the cord either in its development or in its accidental malposition, and it is to an example of this that I desire to call your attention.

CASE REPORT.—Mrs. M. F. E., aged thirty, married July 1, 1920. First consulted me on April 16, 1921, with a history of having had her last regular period January 23 to 28. She flowed slightly for two days in February. The patient's previous history was good. She appeared well nourished, inclined to corpulency and stated that she had gained twenty pounds since her marriage. It was difficult to map out the uterus by bimanual examination on account of the thick abdominal wall but a rather hard rounded mass was definitely palpable in the left adnexal region which was thought to be a tumor of the ovary or possibly a uterine fibroid. A month later the uterine enlargement was definitely palpable. There were no subjective signs of pregnancy noted, no morning sickness, no breast secretion. During the summer the patient began to notice swelling of the hands and feet and she felt life for the first time June 15th. The blood pressure was never above 140, but beginning with the first week of September the patient complained of constant drowsiness which bothered her to such an extent that she was unable to attend to her ordinary household duties. Aside from pyrosis no other symptoms were complained of. The urine at this time showed slight traces of albumin but no casts, with a depressed gravity and a corresponding relative amount of urea. The blood picture was normal. Intensive tingling in the hands and feet together with indefinite neuralgic pains made the patient very uncomfortable. The puffiness of the hands and the edema of the legs and abdominal wall became more marked and as no response followed ordinary dietetic and eliminative measures, I sent the patient to the Lying-In Hospital where, after a week's rest in bed with thorough catharsis, dietetic restrictions, colonic irrigations and hot packs, a rapid improvement occurred. The urinary picture at this time showed little change, slight to moderate traces of albumin and a low specific gravity with occasional granular

\*Read at the Forty-seventh Annual Meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

casts. The blood pressure at this time began to go up slightly and varied from 146 to 150.

Although the pregnancy had been calculated as due about October 30, the patient at this time was evidently not over eight months. On November 15 I ordered two ounces of castor oil as a cathartic and also with the hope that labor might be induced, as the patient had become rather uncomfortable and the abdominal enlargement rather extreme. No pains resulted and the patient was quite comfortable after taking the oil. While engaged in playing cards about six hours after taking the oil she noticed a sudden discharge of blood, no pains were present. I saw her about an hour and a half later and found the bed clothes saturated and internal vaginal examination showed the vagina full with large clots. Patient's general condition was good although she appeared rather pale and the pulse was somewhat rapid. She stated that she had not felt any life since six o'clock. The cervix was rigid, high, thick, one finger dilated and no presenting part could be felt. The fetal heart was not heard. A tentative diagnosis of premature separation of the placenta was made and the patient was sent to the Woman's Hospital. Notwith-

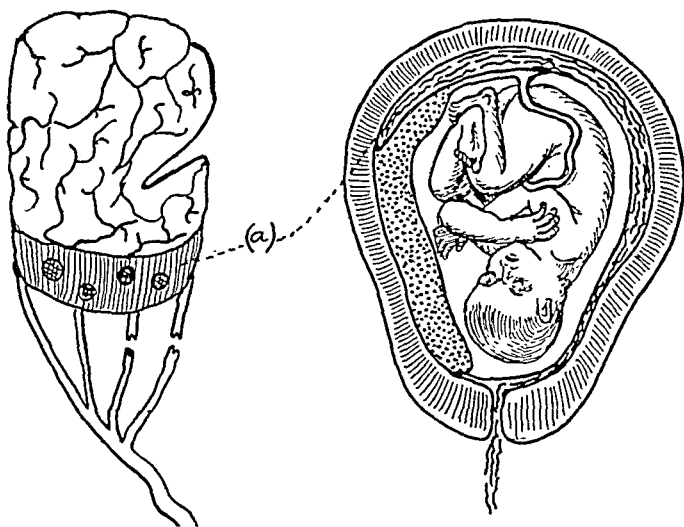


Fig. 1.—Diagrammatic representation of placenta, showing rupture of velamentous cord vessels on the left. The right half of the sketch shows the position of the placenta and the course of the blood from the separated placenta (a).

standing the fact that the fetus was probably dead and that the hemorrhage had lessened at the time of admission I felt it advisable to deliver immediately by cesarean section in view of the long rigid cervix, insufficient dilatation and the fact that the patient had already lost considerable blood with a possibility of a recurrence of the hemorrhage. The cesarean operation was done by the Davis technic. After incising the uterus the hand was introduced and the membranes swept free. The liquor amnii which was evacuated was mixed with fresh fluid blood. A part of the placenta projected into the wound and the organ itself was attached along the right side of the uterus extending down to the lower uterine segment. The child was extracted by the feet. There were no pulsations evident in the cord. The baby appeared exsanguinated and had evidently died recently. After extracting the placenta and membranes the uterine wall was sutured in layers with plain catgut. The uterus contracted well and presented at least one-half dozen fibroid nodules projecting from the surface. One of considerable size in the anterior wall was included in the incision. A tumor as large as a hen's egg which projected from the surface of the anterior wall and appeared to be breaking down

was clamped and excised from its attachment by a broad pedicle. The abdominal wall was then closed in layers and the patient returned to bed in good condition, appearing rather pale but responding satisfactorily to treatment. Further examination of the fetus showed that it was well nourished, the subcutaneous fat slight, that it was very much exsanguinated. The placenta itself was quadrilateral with the cord attached to the upper pole in the form of a velamentous insertion. A rupture had taken place through two of the separated vessels and from this site the fatal hemorrhage had evidently taken place. In addition an area of about two finger-breadths at the upper pole presented several infarcts and had evidently separated from the uterine wall. (Fig. 1.)

In commenting on this case we may state in summary that we are dealing with a primipara in the eighth month of her pregnancy who had gone through a mild degree of toxemia of the nephritic type which had responded favorably to treatment. The placenta presented infarct formation which is often associated with such toxemia and which undoubtedly led to the separation of the organ. It is probable that the uterine contractions induced by the castor oil contributed to the separation of the placenta and that this likewise resulted in the laceration of a portion of the velamentous cord. The sudden gush of blood noted by the patient probably came from the separated placenta although this blood apparently had to travel from the upper pole of the uterus to the cervix between the fetal membranes. There was insufficient dilatation of the cervix and no evidence of placental separation at the lower pole which would have produced this amount of bleeding. Strange to say, the patient did not experience the pain usually associated with premature separation of the placenta. The baby of course died from asphyxia as the result of intrauterine hemorrhage from the cord. It will be noted in this case, contrary to the usual findings, the velamentous cord was inserted at the upper pole of the placenta, whereas in the cases generally reported this anomaly was present in the region of the cervix and rupture occurred as the cervix dilated. In this respect our case differs from those ordinarily observed. The patient made an uneventful recovery, the wound healed by primary union and there was no shock. Subsequent urine examination disclosed nothing abnormal.

Knapp<sup>2</sup> described a twin labor in which both fetuses were lost from this accident, the anastomosis between the cords contributing to the result. Peiser<sup>3</sup> reports a case in a para-iii with two previous normal labors. Her last was spontaneous and the baby was born dead and examination showed rupture of a velamentous cord. Miranoff, reporting the incidence of this complication in the material of the Dresden Frauenklinik noted a frequency of 5 per cent velamentous cords among twin pregnancies and 0.57 per cent in all labors. The occurrence has been variously estimated by several observers as occurring in from 0.4 to 0.9 per cent of all cases.

The diagnosis of the condition and the delivery of a living child is rather unusual. Ahlfeld has had two cases. Hartman<sup>4</sup> reports a case



associated with a lateral placenta previa in which he did a version with the delivery of a living child.

The placental insertion of the cord is subject to considerable variations, most of which are without pathological significance. The presence of the so-called velamentous insertion of the cord must always, however, be regarded as a source of danger to the child. In this anomaly the umbilical vessels become separated at varying distances from the placenta and take a course between the amnion and chorion before reaching their placental termini. This means that when labor begins a rupture of the membranes occurs in the immediate vicinity of these isolated vessels, especially if they happen to be located over the internal os, the umbilical artery or the veins as the case may be, are torn through with the loss of the fetus from hemorrhage, or the advance of the presenting part may compress these vessels and produce fetal asphyxia. Whether these babies are less well developed or whether premature labor may occur as the result of this anomaly, the outcome is doubtful. A considerable number of cases of fetal death from this source have been recorded among them one by Williamson<sup>1</sup> in which the cord ruptured at the upper pole of the ovum when the patient went into the second stage and fetus died notwithstanding a rapid forceps extraction. Williamson believes that if the diagnosis is made early in labor, cesarean section is indicated but after rupture the chances of securing a living child hardly warrants this exposure of the mother.

The frequent association of velamentous cord insertion with placenta previa should lead us to bear this complication in mind. Again, irregular bleeding at the end of the first stage of labor should also lead us to suspect this condition where a lateral placenta was believed to be present and none found on careful examination, especially where the presenting part is well engaged. As for the methods of treatment, it is radical to suggest a cesarean section in order to obviate the long delay incident to complete dilatation of the cervix but where the accident occurs in a primipara with such a severe hemorrhage as in the case herewith reported, due to another cause, cesarean section would be the only method of choice.

It is claimed that velamentous insertion of the cord is always associated with placental anomalies such as previa and succenturiata and also infarcts as noted by De Lee.<sup>5</sup> Multiple fetuses, twins and triplets, are also reported as accompaniments of this cord anomaly.

The diagnosis of the condition is only possible if the pulsating vessels can be felt within the circle of the dilating cervix over the bulging bag of waters. In such cases it may be possible to rupture the membranes between the vessels after dilatation is complete and then deliver the child as rapidly as possible otherwise pressure will produce asphyxia. Where the cervix is not yet fully dilated a Voorhees or other soft rubber bag may be carefully inserted so as not to produce a premature rupture

of the membranes, but fetal asphyxia is readily possible in such cases.

In primiparae, however, such as the present case, with long rigid cervix, even if a diagnosis had been made, such slow methods would have been of no avail. Where the cord is inserted at the upper pole of the uterus, as in this instance, a diagnosis by palpation is, of course, impossible.

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23 EAST NINETY-THIRD STREET.

(For discussion see p. 664.)

## IS INTERFERENCE JUSTIFIABLE AFTER TWENTY-FOUR HOURS OF LABOR WHEN NO OTHER INDICATION IS PRESENT?\*

A STUDY BASED UPON A SERIES OF PROLONGED LABORS  
CONSERVATIVELY TREATED

BY ALFRED C. BECK, M.D., BROOKLYN, N. Y.

THE sense of security which is obtained by the use of the two flap, low incision cesarean section after a test of labor, has led us to resort more frequently to a thorough test of labor whenever relative disproportion exists. By this routine we mean one that has allowed sufficient time for complete dilatation and several hours of second stage pains, as we have learned that accurate conclusions concerning the need for suprapubic delivery can be obtained only after the patient has been permitted to completely dilate her cervix and have several hours of second stage pains with ruptured membranes. While the majority of the patients so treated have been delivered either spontaneously or by some relatively simple procedure, a number of them have been many hours in labor. The end results in these instances of prolonged labor were so satisfactory that we were led to question the value of many of the procedures which have been advised as a prophylaxis against prolonged and difficult labor. In order that we might test out this hypothesis we decided to abandon these measures and accordingly conducted a series of cases in which we paid no attention to the size of the child or the so-called danger of allowing the pregnancy to continue beyond the expected date of confinement. Occipitoposteriors were managed expectantly and no

\*Read at the Forty-seventh Annual Meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

attempt was made to favor dilatation in dry labors. In this series we did not interfere in any way until the patient had at least two hours of good second stage pains unless a definite fetal or maternal indication arose. The use of this routine gave us a considerable number of prolonged labors. While such labors were trying to the patient and required no little courage on our part the results amply rewarded us for the many hours of worry that might have been avoided had we resorted more frequently to operative interference.

## INCIDENCE OF PROLONGED LABORS

Since the beginning of this study 1753 women have been confined in the Long Island College Hospital and by our out-patient depart-

TABLE I  
INCIDENCE OF LONG LABORS

Service cases	1138	Long labors	79
Private cases	615	Long labors	67
Total cases	1753	Long labors	146

TABLE II  
DURATION OF LONG LABORS

24 to 30 hours	63 cases		or 43.1%
30 to 36 hours	30 cases		
36 to 42 hours	15 cases	83	or 56.9%
42 to 48 hours	7 cases		
Over 48 hours	31 cases		

TABLE III  
INCIDENCE OF LONG LABORS IN VARIOUS CONDITIONS

PROLONGED LABOR OCCURRED IN	THIS WAS
62 or 27.7% of the 266 dry labors	42.4% of all long labors
108 " 19.2% " " 556 primiparae	74 % " " " "
22 " 35.4% " " 60 funnel pelves	15 % " " " "
15 " 24.9% " " 61 inlet contract.	10.2% " " " "
80 " 9.7% " " 825 occip. ant.	54.8% " " " "
47 " 21.4% " " 219 occip. post.	32.1% " " " "
9 " 13.2% " " 68 breech	6.1% " " " "
1 " 7.1% " " 14 twin	1.2% " " " "
1 " 11.1% " " 9 fibroid ut.	1.2% " " " "
13 " 10.2% " " 127 4000 gm. child	16.4% " " " "
2 " 20 % " " 5 bicornate ut.	2.5% " " " "

TABLE IV  
INCIDENCE OF LONG LABORS IN VARIOUS CONDITIONS, DRY LABORS EXCLUDED

PROLONGED LABOR OCCURRED IN	
8 or 15 % of the 53 Funnel pelves	10.1% of all long labors
4 " 7 % " " 54 inlet contractions	5 % " " " "
53 " 7.7% " " 798 occip. ant.	64 % " " " "
22 " 11.3% " " 194 occip. post.	26.1% " " " "
8 " 6.5% " " 122 4000 gm. child	10.1% " " " "
2 " 20 % " " 5 bicornate ut.	2.5% " " " "

ment. Of these labors 146 lasted over 24 hours. Of this number 43.1 per cent terminated in from 24 to 30 hours and 56.9 per cent continued for more than 30 hours. The frequency of this condition in private and service cases is shown in Table I. Table II presents a more detailed account of the duration of these long labors. The various conditions that might influence the length of labor were considered individually and collectively. In this analysis the out-patient cases were omitted. Of the 556 primiparae in the hospital series 108, or 19.2 per cent, were in labor more than 24 hours. Slightly over one-fourth of the 266 dry labors were prolonged (see Tables III and IV).

### ETIOLOGY

Early rupture of the membranes seems to be the most frequent of the tangible etiological factors. About one-fourth of the dry labors

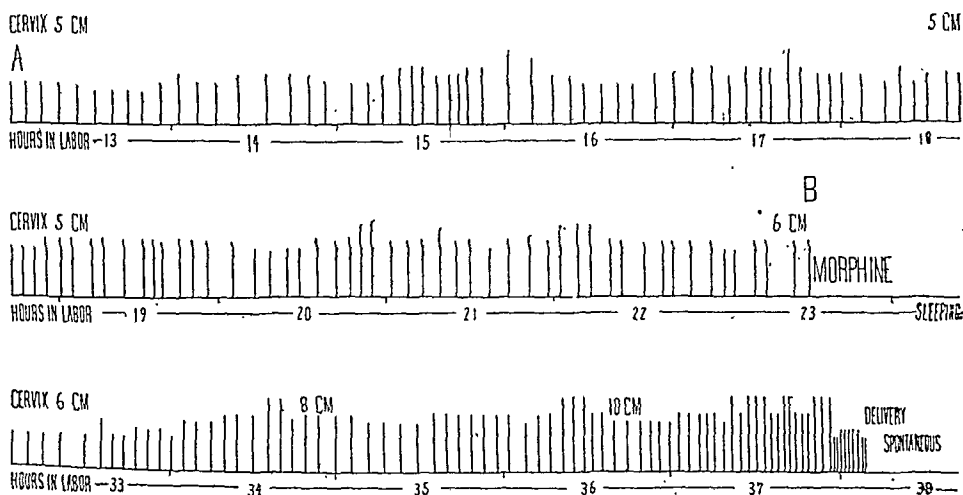


Chart I.—Graphic representation of the uterine contractions during the last 26 hours of a prolonged labor. Each perpendicular line represents a contraction. The height of the line shows the duration of the contraction. The spaces between the lines show the intervals between the contractions. From (A) to (B) the contractions were irregular in frequency and duration, i.e., those of a fatigued uterus and in the 11 hours represented by this part of the chart the cervical dilatation increased only one cm. Sufficient morphine was given at (B) to allow the patient to sleep. Following the resumption of labor the contractions progressively increased in frequency and intensity and the cervix was completely dilated in four hours and spontaneous delivery occurred.

were prolonged. It is difficult to account for the exact cause of the remainder of the long labors in this series. From a study of the individual cases we must conclude that the chief difficulty is one of faulty uterine contractions.

### CONDUCT OF LABOR

In the conduct of all of our labors we aim to have the patient secure as much rest as possible. A senior student is required to remain in the delivery room throughout the entire labor. He keeps a record of the frequency, strength and duration of the uterine contractions. The mother's pulse and temperature as well as the fetal

heart rate are carefully observed. Nourishment is given not as often as the patient wishes it but as often as we can force her to take it. In the intervals between contractions she is urged to rest and, if possible, sleep. As soon as the membranes rupture, if the cervix is fully or almost fully dilated, a snug abdominal binder is adjusted and the voluntary efforts are encouraged. This routine which is followed in all of our cases is an excellent one for those that have long labors since it aims to conserve the patient's strength for the second stage. The only additional measure employed in a prolonged labor is the use of liberal doses of morphine. Whenever the character of the contractions shows that the uterus is fatigued, sufficient morphine is given to stop the labor and allow the patient to sleep. Chart I shows the duration and frequency of the contractions in a prolonged labor. Each perpendicular line represents a uterine contraction. The height of the lines shows graphically the duration of each labor pain and the space between each line represents the interval between contractions. From *A* to *B* the pains were weak and did not progressively increase in frequency. We believe that this is the picture of a fatigued uterus and our experience has taught us that very little dilatation is accomplished by such contractions. The patient received an injection of morphine at *B* and went to sleep. Complete dilatation followed soon after the resumption of labor and delivery was spontaneous. Maternal exhaustion seldom occurred when these long labors were handled in this manner and aside from the anxiety experienced by the attending obstetrician very little added difficulty was observed.

#### END RESULTS

As the private patients were treated by a number of different men and no definite plan was followed in the care of the prolonged labors in this group, the service cases only were considered from the standpoint of the end results. There were 79 long labors in the 1138 general service cases. All but 13 of these delivered spontaneously. Forceps were used in six either because of a marked change in the fetal heart rate or a prolonged second stage. Two breech extractions were done for the same reasons and five labors were terminated by cesarean section. The sections were employed in cases of relative disproportion that failed to engage after a thorough test of labor. Three stillbirths and three infant deaths on the first, fourth, and fifth days, respectively, gave us an infant mortality of 7.6 per cent. One mother died on the third day after a cesarean section. When we consider the fact that these 79 cases (Table V) were the difficult ones of the entire service series of 1138 cases, the end results speak well for the routine which has been followed. Additional proof of the value of conservatism is shown by the end results in the entire series. Of

TABLE V  
END RESULTS IN 79 SERVICE CASES

Prolonged labors	79
Stillbirths	3
Deaths under 14 days	3
Total infant deaths	6 or 7.6%
Maternal death	1 or 1 to 79 cases
Entire series in which these prolonged labors occurred	
Service cases	1138
Stillbirths	21
Deaths under 14 days	14
Total infant deaths	35 or 3%
Maternal deaths	2 or 1 to 568 cases

the 1138 deliveries in which this group of 79 prolonged labors occurred, 21 resulted in stillbirths and 14 infants died within the first two weeks, a total infant mortality of 35 or 3 per cent. Two mothers died, a maternal mortality of 1 to 569 cases.

Should we have resorted to the use of manual dilatation or incision of the cervix and forceps delivery in these instances of prolonged labor? From the fact that in many of these cases the head was not engaged after twenty-four or even thirty hours of labor we doubt very much whether our end results would have been as good had these procedures been used.

Should we have used bags or vaginal packs in our dry labor cases? As there were 138 cases in which the membranes ruptured early this type of interference would have been required that number of times.

Should we have induced labor prematurely in our cases of pelvic contractions? We believe that all but a few of the patients that show relative disproportion will deliver spontaneously if they are permitted to have a thorough test of labor. We therefore feel that a larger number of living infants will be born and that they will have a better chance to survive if we allow these patients to go to term and have a test of labor. We admit, however, that this routine occasionally subjects the mother to the risk of a cesarean section.

Should we have induced labor because of the fear of a large child? As 74 of the infants in the series weighed over 4000 grams, 74 inductions for this indication would have been necessary.

Should more cesarean sections have been done? The large number of spontaneous deliveries that occurred after a test of labor together with our low infant and maternal mortality proved that we were not negligent in the matter of cesarean section.

We doubt very much whether our end results would have been better had we interfered more frequently. Our only conclusion therefore against the routine advocated in this paper is that it calls for considerable courage and is accompanied by considerable worry on the part of the attending obstetrician.

## THE RUBIN TEST AND ITS THERAPEUTIC APPLICATION\*

BY JOHN C. HIRST, M.D., AND CHAS. MAZER, M.D., PHILADELPHIA, PA.

IN ORDER to formulate intelligently the prognosis and therapy of female sterility, a definite knowledge of the patency of the fallopian tubes is essential. The value of transuterine gas inflation as a means to determine this condition has been amply demonstrated by its originator, Dr. I. C. Rubin, and others. The treatment of female sterility was thus placed on a comprehensive and scientific basis.

Assuming for the sake of argument that the mortality of dilatation and curettage and that of the various plastic operations on the cervix is *nil*, the morbidity that frequently follows these operations, especially with the use of the metranoikter and other forms of stem pessary, is well known.

We must also consider the expense and physical discomfort incident to an operation which is done blindly on the assumption that the tubes are not responsible for the existing sterility. These operations are naturally doomed to failure in the presence of obstruction in the tubes.

### FREQUENCY OF OCCLUDED TUBES

In our series of 70 cases of sterility, 64 have never been pregnant, the period of sterility ranging from three to twelve years. In these 64 cases of absolute sterility, 28 were found to have nonpatent tubes. In the six cases of relative sterility, two were found nonpatent.

When it is remembered that the class of patients we treat at the Mt. Sinai Hospital of Philadelphia, submit more readily to the various operations for the relief of sterility than others, one will not wonder that only 10 out of 70 had escaped the surgeon's care during their course of sterility. Some have been curetted three times, a few had plastic operations on the cervix, and several had abdominal operations, apparently for retroversion. None escaped the annoyance and expense of frequent office treatments, supplemented by vaginal douches for long periods.

Parenthetically let us add that women who were previously subjected to some operation for the relief of sterility show a greater percentage of nonpatency than those who have not been operated on. The 10 cases that were not previously operated on, showed nonpatency in only 30 per cent. These figures, while not conclusive, may, if corroborated by other investigators, indicate the danger of dilatation and

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\*Read at a meeting of the Obstetrical Society of Philadelphia, May 4, 1922.

curettage very frequently practiced in cases of doubtful sterility. Many in this series were curetted during the first year of married life, and may have become sterile because of the operation.

The contention of some gynecologists that 70 per cent of primary sterility in the female, yield to dilatation and curettage, supplemented by various nonoperative measures, seems to be grossly overestimated. As shown by our figures 42.5 per cent of primary sterility cases have occlusion of the fallopian tubes,—a condition that precludes the possibility of pregnancy without recourse to an abdominal operation. We believe that no physician should undertake the treatment of sterility in the female without excluding definitely the existence of occlusion of the fallopian tubes. Unless the presence of an active process in the genital tract prohibits manipulation of this sort, the interests of the patient and physician are best served by a definite understanding of the underlying cause of the sterility.

Here is a striking example: One of our patients, aged twenty-nine, married twelve years, consulted one of our foremost gynecologists concerning her sterility, after we had done the Rubin test on her twice and found her tubes nonpatent. He, not knowing our findings, advised a dilatation and an Alexander operation to correct a symptomless retroversion. To make matters worse, he gave her a very hopeful prognosis. When informed by the patient of our findings, he suggested plastic surgery on the tubes and receded considerably in his prognosis.

#### SAFETY OF THE PROCEDURE

We followed up our cases very carefully. In no case was there evidence suggestive of peritoneal irritation. We repeatedly examined our patients and found no pelvic pathology where it did not preexist. When we limited ourselves to the use of oxygen, some cases experienced pressure about the diaphragm and pain in the right shoulder for many hours. The substitution of carbon dioxide eliminated these symptoms, as this gas is very rapidly absorbed. So rapid is the absorption of the carbon dioxide that an interval of only ten minutes between the introduction of the gas and the fluoroscopic examination may give the inexperienced operator a false impression of the result of his examination.

With a moderate experience in the technic, the fluoroscopic examination is unnecessary and the test can be carried out with safety as a routine office examination. The symptoms are so mild and of so short duration, that the patient may go about her daily routine immediately following the examination.

The fear of air embolism is unfounded. In no instance were there symptoms pointing to this condition. As stated by Dr. Rubin,<sup>1</sup> army



surgeons have often used intravenous oxygen injections for therapeutic purposes, especially in pneumonia.

The combined experience of gynecologists in scattered parts of the country is more valuable than theoretical objections to gas inflation on the ground that the method is dangerous.

#### TECHNIC

We shall not go into a description of the apparatus. A careful pelvic examination should precede the test. An acute or subacute cervical or tubal infection should deter the observer from proceeding.

The exact position of the uterus must be ascertained prior to the introduction of the cannula, which must be directed in the course of the uterine canal. Failure to observe this may result in perforation of the uterus.

The vagina is carefully cleansed, the speculum introduced, and the cervix dried and painted with tincture of iodine. The cervix is steadied with a tenaculum applied to its anterior lip. The cannula is introduced in the direction of the uterine canal, a rubber tip on the cannula occluding the external os. The gas is then permitted to enter the uterine cavity. In patent cases the pressure, as indicated by the mercury manometer will immediately rise to about 100 mm. and sharply fall to 40 or 50, at which point it fluctuates until the cannula is withdrawn. When the pressure reaches 150 or more, it is likely that the tube lumen is partially or completely closed. A repeated finding of 200 mm. without any tendency to recession is pathognomonic of nonpatency of the tubes.

When the pressure reaches a high level and then falls sharply to a low level, say to 50 mm., it indicates, in our opinion, that some obstruction was dislodged. We have repeated the test in several of these cases and found that the pressure never reached the high level attained during the initial test. We, therefore, concluded that, whatever the obstruction may have been, it was eliminated as a factor. When the pressure reaches a high level and falls but slightly, fluctuating at 160 mm. or more, a partial stenosis of one tube with occlusion of the other may be assumed. We admit that, thus far, we have insufficient proof to support these deductions, though logically they are sound.

We operated on a woman two days after the Rubin test which gave us the above-mentioned findings. She entered the wards with an acute gonorrheal salpingitis. After twelve weeks of conservative treatment, we decided to correct the adherent retroversion by an abdominal section in the hope of relieving her of the pain in the back and lower abdomen. As traces of the acute infection of the cervix and tubes were no longer in evidence, we ventured to subject her

to the Rubin test preliminary to the abdominal section. The pressure rose to 175 mm., gradually fell to 140 mm., fluctuating at this level until 320 c.c. of oxygen were introduced. The procedure gave her considerable pain in the left tuboovarian region. The fluoroscope established the presence of a pneumoperitoneum. On section two days later, we found both tubes apparently normal, the uterus retroverted and fixed. The right tube was probed and found stenosed at the isthmus. We wished to avoid traumatizing the left tube and abstained from probing it. We believe that the pain she experienced during the inflation was caused by the gas passing through a very narrow constriction in the left tube. We did the Grad operation for retroversion without attempting to restore the lumen of the tubes, not wishing to prolong the operation unnecessarily.

For the purpose of producing a pneumoperitoneum preliminary to x-ray, the transuterine method is safer and attended with less discomfort than the transabdominal route. It is obviously limited to non-pregnant married women, free from acute inflammatory conditions of the pelvis. To the gynecologist it offers a valuable aid in the diagnosis of pelvic conditions. Thus far we have done too little work in this direction to deserve mention, but Dr. Reuben Peterson<sup>2</sup> of Ann Arbor, Michigan, has demonstrated its value beyond a shadow of doubt. He draws the following conclusions:

1. Pelvic organs can be clearly demonstrated by the pneumoperitoneal x-ray plate.

2. Owing to the distention with gas, the tubes are rather more clearly demonstrated where the inflation has taken place through the uterus than transabdominally.

3. With improved position (knee-chest and Trendelenburg) the pelvis will be shown clear of bowel coils. Retention of such coils in the pelvis will be proof that intestinal adhesions are present.

As reported by Dr. B. C. Hirst<sup>3</sup> two fatalities recently occurred in Philadelphia as a result of the transabdominal method of pneumoperitoneum. No such accident can thus far be attributed to the transuterine method of abdominal inflation for x-ray purposes.

#### THERAPEUTIC INDICATIONS OF INTRAUTERINE GAS INFLATION

Following a plastic operation on the tubes for the relief of sterility, intrauterine gas inflation will not only reveal to us the success or failure of our endeavor, but also aid in keeping the tubes permeable. Dr. I. C. Rubin<sup>4</sup> produced a transuterine pneumoperitoneum as early as ten days following a transplantation of the tubes. It seems to us sound judgment to inflate the tubes repeatedly in these cases until the danger of a recurrence of the stenosis is well passed.

One negative result is not enough to establish nonpatency. Occa-

sionally a uterine cornual polyp may occlude the tubal ostium as a ball valve and a greater pressure may succeed in forcing the gas through. In such an event a careful exploration of the uterine horns, by means of the curette and placental forceps is, in our opinion, therapeutically indicated.

Very few primary sterility cases give a history of acute pelvic infection. The nonpatent cases may have had a catarrhal salpingitis which, generally, goes unrecognized to resolution. This condition is characterized in its primary state by hyperemia and thickening of the mucous membrane, increased secretion from the mucosa, and some destruction of the cilia.

The acute condition in these cases may subside leaving sufficient inspissated mucus in the tubal lumen to occlude it. We find a similar condition in the eustachian tube, which is structurally not unlike the fallopian tube. A retracted drumhead indicates to the otologist insufficient ventilation of the middle ear because of occlusion of the eustachian tube. To relieve this condition, the otologist resorts to inflation of the nasopharynx under pressure by means of the Politzer bag. He is not unmindful of the possibility of sweeping some infectious material into the middle ear, and selects his cases carefully. He is frequently forced to make several attempts with increased pressure before he succeeds in opening the eustachian tube.

This is probably the condition we find in some cases of fallopian tube occlusion. We inflate the uterus under pressure, the inspissated mucus in the tube or the agglutinated plicae of the endosalpinx offer resistance to the passage of the gas into the peritoneal cavity, as indicated by the mercury manometer. We use greater pressure and the mercury suddenly falls, fluctuating at a low level, until the cannula is withdrawn. Something must have been dislodged to permit the passage of the gas. The peritoneal cavity is a great deal more competent to cope with infectious material swept into it than the middle ear. It is doubtful whether this material is infectious at all.

We have on record three women who became pregnant so soon after the Rubin test, that we are disinclined to view this phenomenon as incidental.

CASE 1.—Mrs. R., (File No. 21-11587) aged thirty, married eight years, had a dilatation and curettage for the relief of sterility four years ago. Menstruation normal, pelvic examination negative. We did the Rubin test on Dec. 12, 1921. Pressure as indicated by the manometer was 150, with a gradual decline to 50 mm. Patency of the tubes proved by the fluoroscope. Pelvic examination on Feb. 23, 1922, showed an enlarged soft uterus. Subsequent examinations established pregnancy beyond doubt.

CASE 2.—Mrs. B. S., aged twenty-six, married seven years, never pregnant. Menstruation normal. Had a dilatation and curettage a year following her marriage. Pelvis showed no evidence of abnormality. The Rubin test on Oct. 4, 1921,

proved the tubes patent. Her first missed period was on Jan. 4, 1922. When seen again recently, the presence of pregnancy was quite evident. This was one of our very early cases when the pressure at which the gas entered the tubes was not recorded.

CASE 3.—Mrs. G., aged twenty-nine, married three years. Menstruation normal. Had a dilatation and curettage eighteen months ago. Pelvic examination showed a retroverted slightly adherent uterus. Tubes and ovaries not palpable. Rubin test on Dec. 22, 1921, indicated nonpatency. Before her physician could arrange for a repetition of the test, the woman had missed her period and when seen later, the presence of pregnancy was quite evident.

#### CONCLUSIONS

1. Before proceeding with the treatment of a case of sterility, it is imperative to determine the patency of the tubes, assuming that the male element is not a factor in the sterility.
2. Nonpatency is more frequent than previous records indicate.
3. The Rubin test is a safe procedure in the hands of the average gynecologist.
4. The transuterine route of pneumoperitoneum for x-ray purposes is better for gynecologic diagnosis than the transabdominal route.
5. The therapeutic possibilities of intrauterine gas inflation deserve attention on the part of the gynecologist.

#### REFERENCES

- (1) Jour. Am. Med., Assn., Sept. 4, 1920. (2) Surg. Gyn. and Obst., Aug., 1921. (3) AM. JOUR. OBST. AND GYNEC., Aug., 1922, iv, 160. (4) AM. JOUR. OBST. AND GYNEC., August, 1922, iv, 192.

1823 PINE STREET.

1626 SPRUCE STREET.

(For discussion, see p. 670.)

# AN IMPROVED METHOD OF SUPPORTING THE BLADDER AND VAGINA AFTER VAGINAL HYSTERECTOMY FOR PROCIDENTIA\*

BY ALFRED HEINEBERG, P.D., M.D., PHILADELPHIA, PA.

**P**ROLAPSE of the vagina and loss of support to the base of the bladder are two of the sequelae difficult to prevent in performing vaginal hysterectomy for procidentia. Success depends upon the following conditions: 1. A shelf of broad ligament upon which the bladder may rest. 2. Sufficient traction, in the right direction, upon the upper part of the vaginal walls. 3. Fascial support to the base of the bladder by reconstruction of the triangular and utero-vesical ligaments, when possible. 4. Narrowing of the anterior vaginal wall by elliptical or triangular resection. 5. Reconstruction of the pelvic floor and decreasing the size of the vaginal outlet by interposition of the edges of the levator ani, transversus perinei and bulbo-cavernosus muscles between the vagina and rectum. 6. Narrowing of the posterior vaginal wall by broad and long triangular resection.

This paper deals with only the first two of these conditions, and presents a technic for disposing of the stumps of the broad ligaments which has given uniformly satisfactory results during the last five years.

While the Mayo method of suturing the cut edges of the broad ligaments to each other in the median line forms an excellent shelf for the bladder, it often fails to prevent prolapse of the vagina because the traction upon the vaginal walls, produced by attaching them to the lower edge of the newly formed shelf, is not sufficient to hold them in place.

The other method in common use, viz: the attachment of the upper stump of each broad ligament to the cut edge of the lateral vaginal wall on its respective side, fails to form a shelf for the bladder. Furthermore, the traction supplied, even though sufficient to hold up the vaginal walls, is of such direction as to stretch the vaginal vault and decrease support to the base of the bladder.

The method which is here described overcomes the chief causes of failure in the two preceding operations. The uterus is removed in the usual manner. The broad ligaments are ligated in section close to the uterus. *The uppermost ligature should include the uterine end of the tube and round ligament.*

If the tubes and ovaries are removed, the infundibulo-pelvic liga-

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\*Read at a meeting of the Obstetrical Society of Philadelphia, May 4, 1922.

ment should be drawn over and its inner end be included in the ligature applied to the uterine end of the round ligament.

The upper stumps of the broad ligament thus formed are brought across the median line of the pelvis so that the stump of the left ligament may be sutured to the cut edge of the right vaginal wall

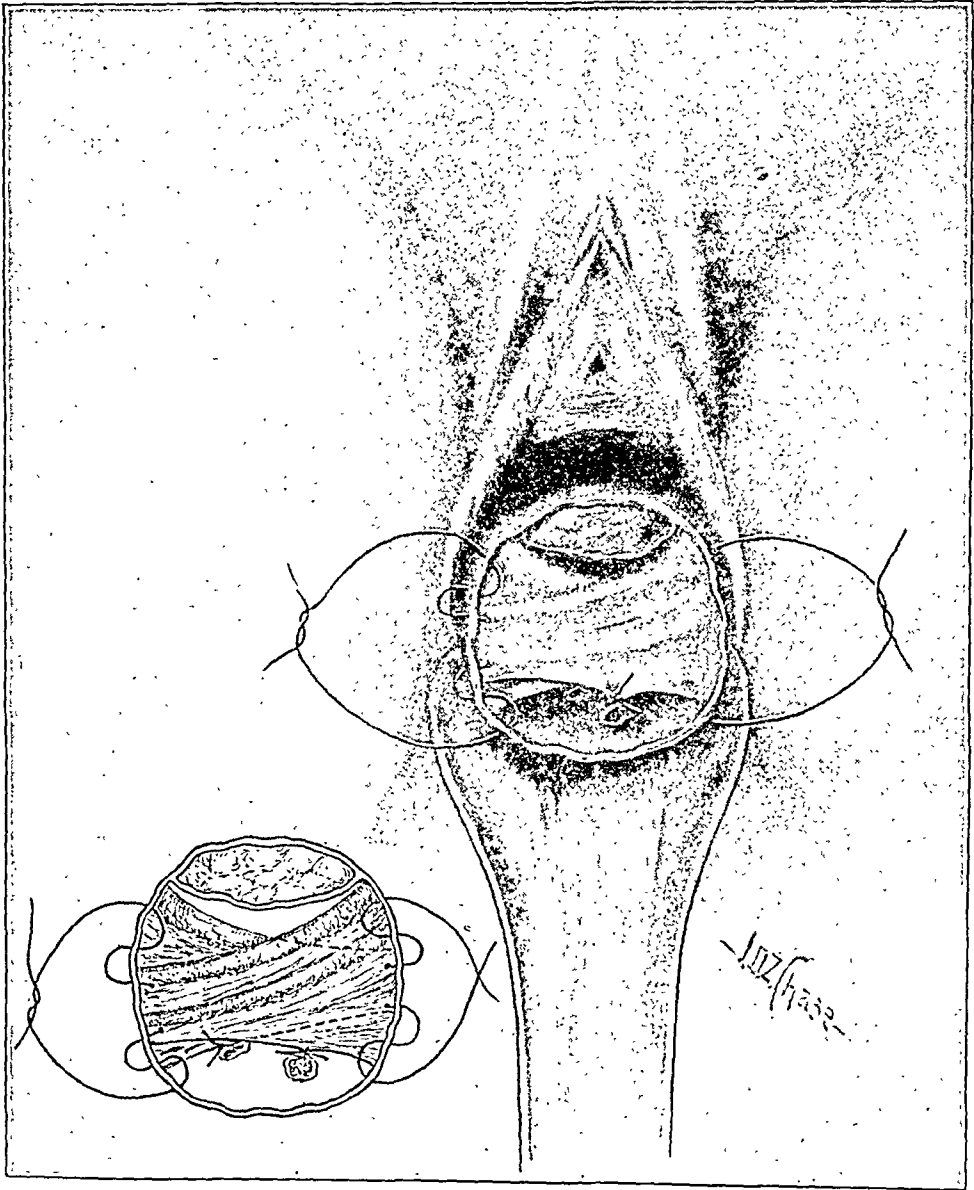


Fig. 1.

and, *vice versa*, that of the right ligament to the left vaginal wall. The stumps are not brought into the vagina but are inserted into a pocket, external to the upper end of each lateral vaginal wall.

The degree of traction to be made upon the vaginal walls should be carefully gauged. It can be adjusted by drawing down the ligament, determining its length and tension and selecting a point in it to which it is desired to suture the vaginal wall. The suture I

employ is a purse-string, which includes (along with the broad ligament stump) about one-fourth of the circumference of the opening in the vaginal wall on each side (see Fig. 1). The effect of such a suture is to support and contract the vaginal vault. The suture on each side should be applied before either is tied. While traction is made upon both ends of each suture, drawing the ligaments into the position they are to occupy, the edge of the posterior vaginal wall is sutured to the posterior surface of the interposed ligaments. Subsequent to resection, the upper edge of the anterior vaginal wall is sutured to the anterior surface of the ligaments.

The advantages of crossing the broad ligaments and attaching each to the vaginal wall of the opposite side are:

(a) To form a shelf for the bladder.

(b) To close the opening in the vagina by means of the oblique traction upon its walls.

(c) To prevent dilatation of the vaginal vault and consequent lessening of the support to the base of the bladder.

1923 SPRUCE STREET.

(For discussion, see p. 671.)

## POSTABORTAL HEMOLYTIC STREPTOCOCCEMIA\*

BY PHILIP F. WILLIAMS, M.D., PHILADELPHIA, PA.

*From the Gynecological Service of the Presbyterian Hospital*

THE normal ratio of abortions to births at term is generally considered as about one to four or five. There can be no doubt that the actual number of abortions is higher than this ratio would show, and of the etiological factors responsible, at least as seen in hospital practice, induction of abortion by illegal instrumentation is not the least frequent cause. The statistics of Meyer,<sup>†</sup> from the Carnegie Institute of Embryology, would seem to indicate that about 10 per cent of all abortions were admittedly mechanical in origin.

Whether or not the economic conditions prevailing in recent years, which make the bearing and raising of a large family such a costly experiment, whether fear of the pains of labor, the shame of illegitimacy, or an unnatural feeling toward the discomforts and annoyances of motherhood, or the gradually developing widespread discussion of birth control and a feeling of necessity to practice it are responsible factors, can only be determined in each individual case by a full knowledge of the facts concerned. Many women coming under observation openly express themselves of the desire of getting rid of an early pregnancy, and failing, as so often happens in medica-

\*Read at a meeting of the Philadelphia Obstetrical Society, May 4, 1922.

<sup>†</sup>Meyer, A. W.: The Frequency and Cause of Abortion. *AMER. JOUR. OBST. AND GYNEC.*, 1921, ii, 138.

tive measures, are prone to practice interruption of the pregnancy by directly and instrumentally interfering with the ovum in situ, or to have this done for them.

The grave, and often fatal, consequences of such practices are seen in all gynecological services in the large number of septic conditions, local and general, which follow upon unclean instrumental induction of abortion. Indeed, criminally induced abortions are subject to febrile complications in a large majority of the cases. The occurrence of four cases of abortion, complicated by hemolytic streptococcemia, with recovery under the use of antistreptococcic serum, on the gynecological service of the Presbyterian Hospital during the past year seemed of sufficient interest to warrant reporting them, together with some pertinent comments.

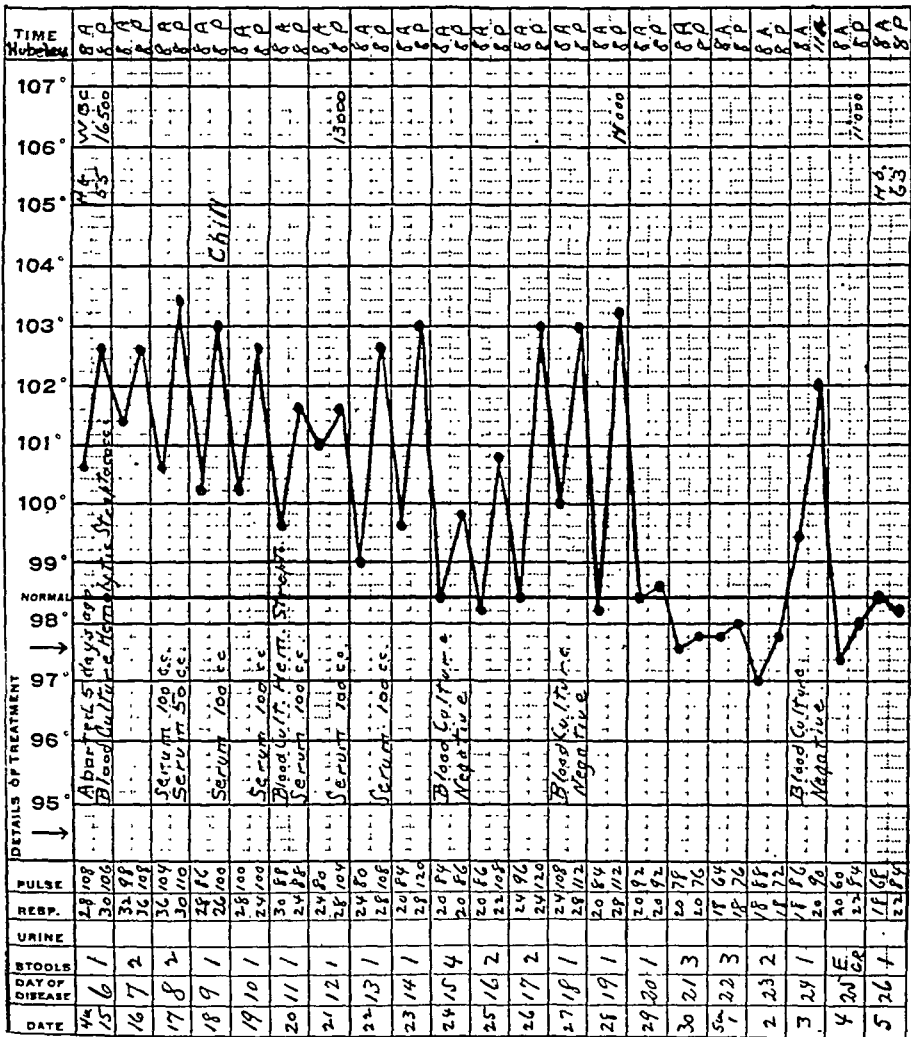
The subject of hemolytic streptococcic infections has undoubtedly been subject to more widespread interest since the extensive bacteriological studies of the infections caused by this organism in the cantonments during the war. These investigations have shown that this streptococcus is of unusual virulence when awakened to its full pathogenicity, and that it is found dormant in many hidden or cryptic foci of infection, as the tonsils, nasal sinuses, and diseased teeth. A brief review of the literature on the bacteriology of the genital tract in women shows that this organism is not infrequently present in the vaginal and cervical secretions. Naturally, unclean surgical procedures opening up relatively large areas of wound surface, through the production of abortion, lend ample opportunity for the proliferation and full development of the pathogenicity of the organism, with easy invasion of the blood stream. In order to determine the relative incidence of carriers of the hemolytic streptococcus a series of cultures from the cervical canal of one hundred women, in the child bearing period, were taken at the gynecological dispensary of the Presbyterian Hospital. Seven women showed positive cultures for hemolytic streptococci, and eleven women showed positive cultures of non-hemolytic streptococci in the cervical secretions. Permar\* reviewed this subject in 1917, adding his observations on 130 women, and according to his findings and those of other observers, whose work he summarized, an even larger percentage of hemolytic and other types of streptococci were found in the cervico-vaginal tract than in the present series. The dangers of intrauterine procedures through such potentially dangerous regions without antiseptic precautions are quickly apparent. The treatment of abortions, for such complications as hemorrhage, when the organisms have been carried into the uterus, are as gravely fraught with peril through the possible further opening up of avenues of invasion to the blood stream.

\*Permar, H. H.: An Analysis of the Vaginal Flora in Late Pregnancy, *Am. Jour. Obst.*, 1917, lxxv, 652.



The abridged clinical histories and temperature charts of the four patients show plainly the manner of onset and course of the disease and its control by the use of antistreptococcic serum.

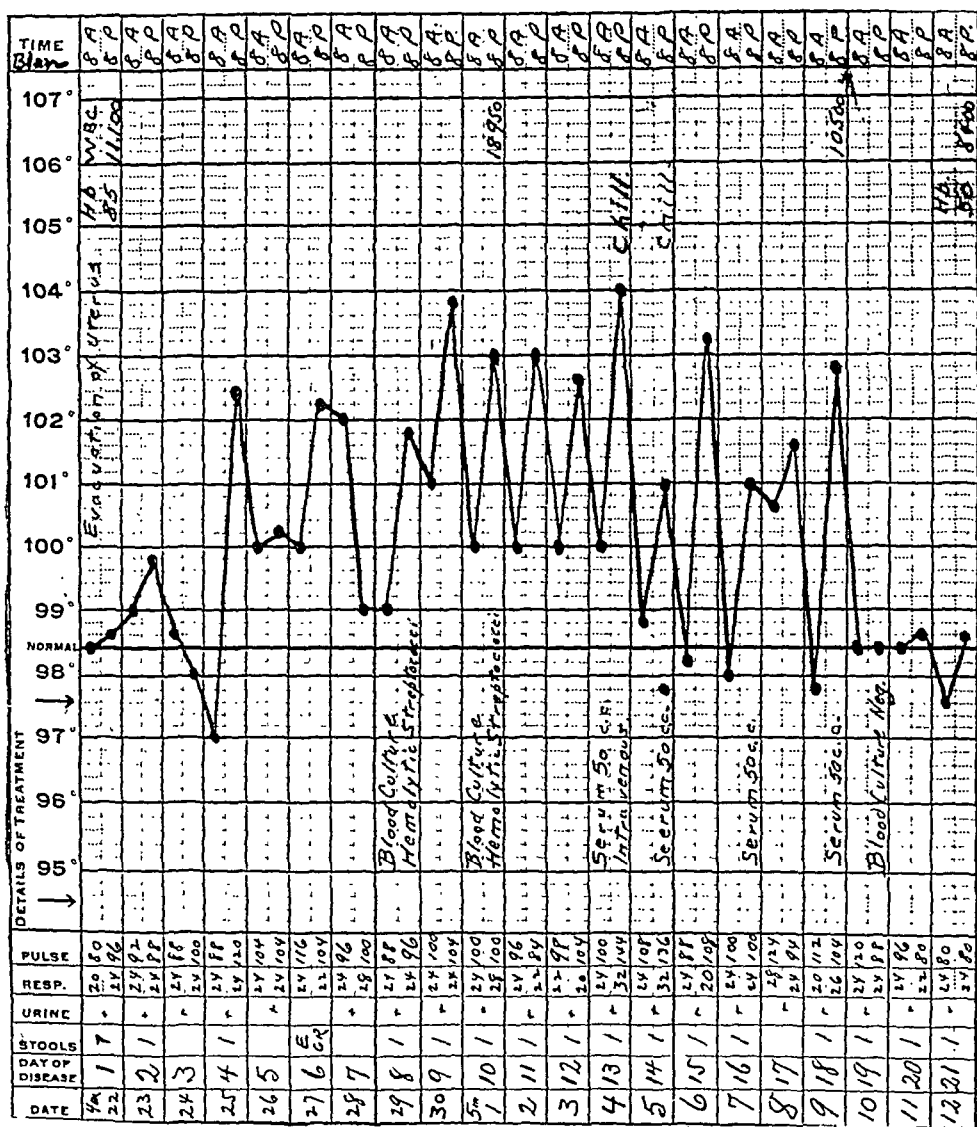
CASE 1.—C. H., a white married woman, aged 28 years, was admitted on April 14, 1921, for cough and fever following an abortion. The patient had had one pregnancy with a living child. Menses regular, last period December 19, 1920. On April 9, 1921, five days before admission, patient aborted following selfinduction



Case 1.—Temperature chart.

with an instrument, the nature of which was not stated. While in labor she had chills and fever and attacks of vomiting. An attending physician stated that the abortion had been complete. Examination showed a recently parturient multiparous genital tract, with reddish purulent lochia having a foul odor. The external os was open, the uterus enlarged, anteverted and not tender. There was slight tenderness in both lateral vaginal fornices. Physical examination of the chest revealed a suspicious area of dulness in the right lower lobe. Cervical and blood cultures showed pure cultures of hemolytic streptococci. April 17, two days after admission,

150 c.c. of polyvalent antistreptococcic serum was injected intravenously. This was followed by a rise in temperature. A total of 500 c.c. of serum was injected during the next five days. After 200 c.c. had been given an intense serum reaction occurred. After this, desensitization was practiced before injections of serum. Although the blood cultures became sterile on April 24 the temperature continued high and of a septic type until April 28. On May 3 there was an unaccountable rise in temperature, which, however, quickly subsided, and the temperature con-



Case 2.—Temperature chart.

tinued normal until discharge. On May 10 the patient had an intense urticaria of short duration, possibly a delayed serum reaction. The number of colonies per Petri blood agar plate dropped from 97 on admission to 4 on April 20 after a total of 350 c.c. of serum had been given. Blood count on admission, erythrocytes, 2,760,000; leucocytes, 16,000; hemoglobin 55 per cent. On discharge, erythrocytes, 3,400,000; leucocytes, 10,000; hemoglobin, 68 per cent. The differential counts showed a good resistance as the polymorphonuclear neutrophils ranged from 75 to 83 per cent. Wassermann reaction was negative. No further evidence of the suspicious pneumonic area in the right lower lobe was elicited on repeated examinations





growth. Temperature continued normal until discharge May 22. Blood count on admission, erythrocytes, 4,450,000; leucocytes, 11,100; hemoglobin, 85 per cent. On discharge, erythrocytes 2,380,000; leucocytes, 8,400; hemoglobin, 50 per cent. A differential count made May 1, during the acme of the infection showed 82 per cent of polymorphonuclear neutrophils. Wassermann reaction was negative. Patient was given a total of 200 c.c. of serum. Chills followed two of the injections. The mental attitude of the patient, who expressed a desire to die, was responsible for the delay in earlier serum treatment.

CASE 3.—E. S., a white married woman, aged twenty-eight years, was admitted July 2, 1921, for fever and a severe burning headache following an abortion. Patient had been pregnant five times, three children living and two abortions, one in 1919 and one in 1920. She had been curetted at home following the abortion in 1919. Menses had been irregular and frequent, for the last year had been bleeding profusely, often twice a month. Last period, latter part of May, 1921. On June 28, four days before admission, patient began to bleed from vagina after lifting a heavy wash tub filled with water. An attending physician made a vaginal examination and stated "that something was hanging from womb", and for patient to save any material passed for his further examination. Patient stated that on the following day she passed an afterbirth, and developed simultaneously fever and chills, and an inguinal adenitis. Examination showed a multiparous genital tract, with sticky reddish yellow leucorrhea in the vagina and cervical canal. The internal os was closed, the uterus enlarged, anteposed and movable, not tender. Tenderness in both sides of the pelvis on bimanual examination. A right inguinal adenitis was present. Temperature on admission 103°, pulse rate 128, respiratory rate 24. A blood culture taken on admission was reported as sterile, no growth. Temperature continued elevated and of a septic type. The case was considered as a complete abortion with pelvic peritonitis, and the patient was placed in the Fowler position, with enteroclysis of glucose and bicarbonate solution, and given digalen and a liquid diet. A catheterized specimen of the urine showed a growth of colon bacillus on culture, but no pus in the urine and no kidney or bladder symptoms. Widal and other agglutination tests negative. On May 11 a second blood culture was taken and reported positive for hemolytic streptococcus. May 12, 50 c.c. of a polyvalent antistreptococcal serum injected intravenously. Temperature fell rapidly to normal. May 15, blood culture still positive and second similar injection of serum given. Temperature fell to normal and continued so, with but one flare-up, until discharge. Blood culture July 25 was reported as sterile, no growth. Patient was given a total of 100 c.c. of serum. On July 18 she developed an urticarial rash of short duration which was interpreted as a delayed serum reaction. Wassermann reaction negative. Blood count on admission, erythrocytes, 3,460,000; leucocytes, 13,800; hemoglobin, 78 per cent. On discharge, erythrocytes, 3,220,000; leucocytes, 7,800; hemoglobin, 60 per cent. Polymorphonuclear neutrophils did not drop below 74 per cent. The intense headache of which the patient complained, and which she stated felt "like a ball of fire" persisted until July 9, suggesting meningeal irritation, but disappeared overnight like magic. After the first negative blood culture, other infections were ruled out, but the error in earlier diagnosis of the true condition lay in the too quick acceptance of one negative blood culture as proof that no blood stream infection was present.

CASE 4.—J. M., a white woman, aged thirty years, separated from her husband, was admitted on September 29, 1921, for vaginal bleeding. A very incomplete history was obtained. Patient admitted that an instrument had been passed into the uterus for the purpose of bringing on an abortion, on each of four successive days before admission. On admission the temperature was 97°, pulse rate 84, and respir-

atory rate 24. The cervix was dilated and packed with iodoform gauze. Within a few hours after this minor operation the patient had a severe chill, the temperature rising after the chill to 106°, the pulse rate to 128, and the respiratory rate to 40. Blood culture taken was reported positive for hemolytic streptococcus, and fifty c.c. of a polyvalent anti-streptococcic serum injected intravenously. Temperature dropped to 97.2°, pulse rate to 96, and the respiratory rate to 28. On October 1, under gas anesthesia, the uterus was evacuated of an early ovum. Temperature rose to 103°, and continued elevated. On October 2 an injection of 100 c.c. of serum was given. Blood culture taken on October 6 was reported as sterile, no growth. Patient had an urticarial rash on October 6, and complained of stiffness of body. This was considered as a reaction to the serum. On the same date the patient developed an axillary furunculosis, with the staphylococcus aureus in pure culture as the offending organism. An autogenous vaccine was prepared and used subsequently with good results. The temperature dropped to normal on October 9, and continued for six days. Then a mild pyrexia occurred during four days, which was attributed to a cystitis, pus being found in the urine, although no bacterial contamination was present. Thereafter the temperature continued normal until discharge, October 25. Convalescence was marked by hallucinations and by a sciatica neuritis which persisted for some weeks. Blood count on admission, erythrocytes, 3,680,000; leucocytes, 12,700; hemoglobin, 65 per cent. On discharge, erythrocytes, 3,120,000; leucocytes, 13,600; hemoglobin, 55 per cent. A single differential count made during the infection showed 89 per cent of polymorphonuclear neutrophils. Wassermann reaction was negative. The patient received a total of 250 c.c. of serum. The reaction to the serum was an urticaria developing after the third injection. The furunculosis was evidently an extraneous infection. The mental change, the sciatica neuritis and the cystitis all developed after the blood cultures had become sterile and can scarcely be placed as due to the blood stream infection. It is interesting to note, however, that two of the patients had meningeal or cerebral irritation as an added feature of their disease.

#### DISCUSSION

In three of the four cases the abortion was produced criminally, in two by the patient herself. In the second case the cause of the abortion may possibly be laid to the strain of lifting such a heavy weight as described. Two of the pregnancies were illegitimate, a frequent finding in the histories of cases of criminally induced abortions. In the first, and probably in the third case, the bacteremia was present upon admission, although the blood culture taken on admission of the third case was reported as sterile. In the third case the head of the fetus had been expelled prior to admission. Here the infection was not manifested until the third day after operation. It may be stated here that the term evacuation of the uterus, as used in these histories, includes only digital exploration of the uterine cavity, the use of blunt placental forceps and a gauze swab to brush decidua remnants from the uterine walls, no curettes being used. In the fourth case following simple dilatation of the cervix and the introduction of an iodoform gauze tampon to promote spontaneous expulsion of the uterine contents, the case being considered as one of incomplete abortion, invasion of the blood stream occurred within a

few hours. Although the cervical culture in one case showed a pure culture of hemolytic streptococcus, identical with the results of the study of the blood, reliance cannot be placed, as a rule, on cervical or vaginal cultures on account of the abundant and mixed bacterial flora of the uterovaginal canal in the nonpregnant state, and consequently as great also in the puerperal or postabortal states. The number of injections and the amount of serum necessary to control such blood infections varies, and one can be guided only by the temperature chart, the condition of the patient, and by the results of repeated blood cultures. If a fixed technic is used in the laboratory, the number of colonies on blood plates may serve as an index to the control of the infection. Reactions to the serum were the rule, and varied from mild to severe chills and urticarial rashes. Desensitization had to be practiced in one case of severe reaction, the first. The urticarial rashes were quickly alleviated by dilute phenol lotions. The effect of the organism, which shows as its chief cultural characteristic the destruction of erythrocytes, did not produce as severe a destruction of the erythrocytes and hemoglobin in the circulating blood as might have been expected. All had a certain degree of secondary anemia upon discharge from the hospital, but not more than might have been the result of an equally severe infection of the same duration from other organisms in the postabortal state. What specific influence the serum had in controlling the anemia by reducing the blood destroying properties of the invading organism is open to speculation.

#### SUMMARY

Four cases of postabortal bacteremia, hemolytic streptococcic, with recovery under the use of polyvalent antistreptococcic serum are recorded. Illegal instrumentation to produce abortion is considered as the chief etiologic factor in the production of three of these infections. The dangers of nonaseptic procedures are made well evident when one considers that in a series of 100 women, seven harbored the hemolytic streptococcus in the cervical canal, and eleven others showed nonhemolytic types. A prompt diagnosis of the exact nature of such febrile conditions is best made by early, and if necessary, repeated blood cultures. Cervical cultures, if positive, and showing the same organism as that recovered from the blood stream, are of value in supporting the theory of the causation of these infections. Serum should be given early and in repeated doses, ranging from 50 to 100 c.c., depending upon clinical and laboratory findings. Reactions are the rule and vary from mild to severe chills and skin rashes. Desensitization may be necessary in cases of severe reactions. The action of the hemolytic streptococcus on the circulating blood has

not been as severe as might have been supposed. The cases reported here showed but little pelvic pathology, the most noteworthy finding being a slight degree of peritonitis and parametritis.

My indebtedness to Dr. John H. Girvin, Chief of the Gynecological Service, for permission to use the material upon which this report is based, is hereby acknowledged with thanks.

262 SOUTH TWENTY-FIRST STREET.

(For discussion, see p. 672.)

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## IS THE USUAL METHOD OF PREPARING PATIENTS FOR DELIVERY BENEFICIAL OR NECESSARY?

BY R. A. JOHNSTON AND R. S. SIDALL, BALTIMORE, MD.

THOSE who are familiar with the history of puerperal infection realize that to Semmelweis belongs the credit of having first indicated the cause of the disease and the mode of its prevention. Oliver Wendell Holmes in his famous article proved that the propagation of puerperal infection took place by contagion or inoculation. In spite of this pioneer work and the recent advances in asepsis, we are confronted each year in this country with approximately 10,000 maternal deaths from this disease alone. Although the medical profession has been taught to conduct all deliveries with the same technic as major surgical operations, and that rectal should replace vaginal examinations whenever possible, yet puerperal infection still occurs in spite of the most careful supervision, and like the poor, is always with us.

Certain cases of puerperal infection, however, are not preventable and the obstetrician cannot be blamed for their occurrence. The gonococcus often causes a stormy puerperium after having existed for years in the female generative tract without giving rise to any serious symptoms. Although there is a difference of opinion among authorities as to the possibility of autogenous infection yet it seems permissible to assume that ascending puerperal endometritis may occur as a result of the presence of pyogenic organisms in the vagina. The possibility of hematogenous puerperal endometritis has been established, and an example from this service was recently reported by Johnston and Morgan. While such occurrences are rare, yet, its possibility must be considered and the attempt made to rid the pregnant woman of all foci of infection, so that organisms may not gain access to the puerperal uterus, a *locus minoris resistentiae*. We shall dismiss from consideration those cases of unpreventable puerperal fever and discuss the factors which may play a part in a normal delivery.

In order to familiarize one's self with the routine employed in the



care of an obstetrical case in the hospital, a brief account of the usual technic is necessary. The patient having been observed in the prenatal clinic enters the hospital at the onset of labor. The nurse shaves the pubic hair, scrubs the external genitalia and the inner sides of the thighs with green soap and water; and, if labor is imminent or a vaginal examination is necessary, the preparation is completed by pouring sterile water, alcohol and a weak solution of bichloride of mercury over the vulva and adjoining area. Rectal examinations are made routinely, and vaginal examinations are allowed only for the instruction of students or in the presence of some abnormality. The latter are made under the supervision of a member of the house staff. At the time of delivery every effort is made to preserve a sterile field, as well as to prevent the contamination of the vagina by the introduction of fingers and instruments. A primary repair is made whenever perineal laceration occurs. During the puerperium the bowels are kept open by catharsis. Vaginal and intrauterine douches are rarely if ever used. Temperatures are recorded every four hours; and, if an elevation of  $100.4^{\circ}$  or above occurs on two successive days, excluding the day of delivery, the puerperium is arbitrarily designated as febrile. In such cases, every effort is made to ascertain the cause of the elevation and puerperal infection is assumed when all other organs have been found normal.

In order to study the factors which may play a part in the causation of puerperal morbidity, the histories of 1059 labors occurring in the Obstetrical Department of the Johns Hopkins Hospital during part of the years 1918, 1919, 1920 were analyzed, thus establishing an average for the work of three groups of internes. These figures do not include abortions, cesarean sections, admissions postpartum, or patients in whom the elevation during the puerperium was attributed to some intercurrent disease or localized infection other than the uterus or its appendages. Cases of eclampsia are also excluded because Kellogg has recently claimed that the incidence of uterine infection is very much increased in toxemic patients.

#### TYPES OF DELIVERY

In the series there were 128 operative deliveries, exclusive of cesarean section, while spontaneous labor occurred in 931 instances. In the former the morbidity was 39.1 per cent, while in the latter it was 18.9 per cent (Table I). In other words, in our series, operative interference doubled the incidence of morbidity as one would expect. Dorman and Lyon recently reported the morbidity at the Woman's Hospital in New York as 17.5 per cent, Keukenschriever and Doosenbos found a morbidity of 16 per cent in 1000 cases of labor in Japanese women, which is approximately the same as in our series (18.9

per cent). Hereafter, because of the numerous uncontrollable factors, operative cases will be eliminated from our discussions.

TABLE I

Operative		128 cases	Spontaneous Deliveries		931
Puerperium	Afebrile	78	60.9 per cent	Afebrile	756 81.1 per cent
	Febrile	50	39.1 per cent	Febrile	175 18.9 per cent
	Total	128		Total	931

*Vaginal Examination.*—As previously stated, rectal examinations are made routinely, and vaginal examinations are employed only for teaching purposes. However, in spite of the use of sterile rubber gloves it was found that where vaginal examinations were made, the morbidity was 22.9 per cent in contrast to 16.4 per cent in the patients not examined vaginally. This increase of 6.5 per cent morbidity makes one realize that vaginal examination under any circumstance is fraught with danger to the parturient woman.

TABLE II

Vaginal examination			350	No vaginal examination			581
Afebrile	270 cases		77.1%	Afebrile	486		83.6%
Febrile	80 cases		22.9%	Febrile	95		16.4%
		350	100%			581	100%

*Perineal Lacerations.*—A careful inspection of the perineum is made after each delivery and lacerations are repaired whenever they occur. The postpartum care of the perineum is minimal, due to the fact that Plass has shown that frequent “pitcher douches” give poorer results than if the perineum is let alone. The resistance of the perineal region to infection is generally recognized and the part played by infected lacerations in morbidity is practically *nil*. It is also evident from our observations that tears play very little part in the causation of morbidity, as is shown by the fact that of 361 cases with perineal lacerations 65, or 18 per cent, had febrile puerperia as contrasted with 19.3 per cent in 570 cases with the perineum intact. Table No. III shows this in detail:

TABLE III

Perineum Lacerated			36	Perineum Intact			570
Afebrile	296		82%	Afebrile	460		80 %
Febrile	65		18%	Febrile	110		19.3%

*Premature Rupture of Membranes.*—Rhode considers that the escape of amniotic fluid does not play a rôle worthy of consideration in the causation of fever. Dorman and Lyon also reached the conclusion that the length of time that the uterus is drained is in itself a negli-

gible factor in the causation of morbidity, but in our experience premature rupture of the membranes is consistently followed by morbidity in proportion to the number of vaginal examinations. Slemons, however, on the other hand found that prematurely ruptured membranes played an important rôle in placental bacteremia. From our observations, in premature rupture of the membranes the morbidity percentage is increased as shown in detail by Table IV.

TABLE IV

Membranes ruptured prematurely			Membranes ruptured normally		
Afebrile	123	76.95 per cent	Afebrile	633	82.1 per cent
Febrile	37	23.15 per cent	Febrile	138	17.9 per cent
160			771		

Consequently, until more convincing observations are made, it seems permissible to conclude that premature rupture of the membranes, in the absence of vaginal examinations, intrauterine manipulation and prolonged labor, plays very little if any part in the causation of morbidity.

*Catharsis.*—McPherson in a series of 1800 patients found that catharsis routinely after the first day of delivery, increased the morbidity percentage, but in a very limited number of cases in which castor oil was given routinely the day after delivery to every alternate case, it was our experience that the care of the bowels played practically no part in the causation of morbidity. Table V is self-explanatory.

TABLE V

40 with catharsis			40 without catharsis		
Afebrile	32	80%	Afebrile	31	77.5%
Febrile	8	20%	Febrile	9	22.5%

All of these patients were delivered spontaneously and the factors previously discussed occurred in approximately the same proportion as encountered in the first series of cases.

#### DISCUSSION

It seems to be a constant finding that in every one hundred spontaneous deliveries there are approximately nineteen women who have an elevation of temperature of 100.4° or above on two successive days, and in view of the conditions previously discussed there appeared to be very little hope of reducing such morbidity. It was a general impression on the part of members of the staff that women delivered precipitately before any preparation could be made rarely had febrile puerperia. Lankford, in a plea for the use of iodine in the preparation of women for delivery, describes how the use of soap and water

tends to wash contaminating material into the vagina, especially in multiparae; so it seemed plausible to assume that the routine preparation employed in our clinic might possibly be harmful rather than beneficial. In an effort to substantiate this assumption the routine preparation was purposely omitted in forty-four consecutive cases, and it was found only four of them or 9.1 per cent had a febrile reaction. In view of this, it was decided to extend our experience in this respect by omitting the routine antepartum preparation in every alternate patient, clipping only the vulval hairs, and then compare the results obtained in the two series. In instances where the temperature elevation could be definitely assigned to mastitis, pyelitis, or other causes than puerperal infection the cases were eliminated without serious change in relative results.

This was done in 389 cases, and the table below shows the results obtained.

TABLE VI

Routine preparation			No preparation		
Afebrile	164	83.7 per cent	Afebrile	169	87.6 per cent
Febrile	32	16.3 per cent	Febrile	24	12.4 per cent

In Table VII are given the results obtained by employing all cases used in this paper.

TABLE VII

Prepared			No preparation		
Total	Febrile	Per cent	Total	Febrile	Per cent
931	175	18.9			
(40 with catharsis	9	22.5	44	4	9.1
(44 no catharsis	8	20			
196	32	16.3	193	24	12.4
1207	224	18.7	237	28	11.8

From so limited a number of cases one scarcely dares to draw binding conclusions. However, as the incidence of vaginal examinations, premature rupture of membranes and perineal lacerations was the same as before, it seems permissible to conclude that slightly better results follow the omission of the routine preparation, and that contamination incident to its employment might explain the difference in morbidity. Further investigation along this line will not be amiss.

In an effort to procure a better method of preparing patients for delivery one naturally considers the qualities of the different skin antiseptics. The disadvantage of tincture of iodine in such cases is apparent. Brown, Cassegraine, Gibson and others, found picric acid very efficient and enumerate its advantages as follows: Nonirritating to the skin, much cheaper than iodine, four times as bactericidal as carbolic acid, can be used after water. Hewitt in recent experi-

mental studies found picric acid one of the best antiseptics for rendering the skin sterile, especially when it has been previously treated with ether. Granting our routine preparation may be at fault and in view of the advantages of picric acid, it seems that its employment might give better results than have previously been obtained. Further study should be undertaken to either prove or disprove this point.

#### SUMMARY

1. Our findings indicate that many factors play a part in the causation of morbidity.
2. Operative interference doubled the incidence of morbidity.
3. Vaginal examination, regardless of sterile gloves, increased the danger to the patient.
4. Catharsis and laceration of the perineum ordinarily do not influence the puerperium.
5. The increase in morbidity in the cases of premature rupture of the membranes is due most probably to other factors and not to the length of time the uterus is drained.
6. Better results were obtained in a limited number of patients not prepared routinely.
7. The use of picric acid theoretically may give excellent results in the preparation of patients for delivery, and further study of results following its use is indicated.

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## DOES THE OVUM OR CORPUS LUTEUM CONTROL THE OVARIAN AND UTERINE CYCLE?\*

BY HELIODOR SCHILLER, M.D., F.A.C.S., CHICAGO, ILL.

**I**N experimental work on rabbits done several years ago, I could demonstrate that extracts of the corpus luteum, which are on the market in glass ampules, when injected into female rabbits in the proper doses, exert specific reactions in the genital organs. I performed these experiments in the early winter, during the season when reproduction is not active and used the precaution to employ rabbits which were not fully matured and not over six months old. Nearly every one of them showed, after injection of two c.c. of the watery corpus luteum extract during seven consecutive days, a condition which simulated that of heat, not only in the behavior of the animal, namely, marked nervousness, but also in the decided enlargement and hyperemia of the uterus and tubes, in micro- and macroscopic changes of the mucosa of the uterus similar to those before heat, and changes of the vagina and mamma. At no time was I able to detect hemorrhage from the vagina or secretion in the mammary glands. The histologic examination of the ovaries of these rabbits did not give constant enough changes to permit me to make any conclusion concerning the action of the watery corpus luteum extract upon the ovary. Other investigators, using emulsions of corpus luteum or ether and acetone extracts, report reactions in the ovaries such as increased precipitate, maturing of follicles, and increased cell activity in the interstitial gland.

In the early winter of this year I continued these experiments. Rabbits, which had been castrated six days previously, were injected subcutaneously with the same amount of watery extract of corpus luteum for the same period of time, but no changes in the uterus, tubes or vagina, or in the mucosa of the genital tract could be detected. This different outcome of the experiment in the normal and castrated animals gave me a stimulus to investigate these findings and the probable cause of them, and to study the correlation between the corpus luteum and menstruation and the probable influence of the corpus luteum upon the ovarian and uterine cycle.

It is estimated that there are from four hundred to eight hundred thousand primordial follicles in the human ovary, and many millions in some of the lower animal species. Nature provides everything in abundance, if we consider, that in the human only five to

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six hundred ova finally mature. While the majority of the follicles after growing to a certain size, degenerate before maturing and become atretic, a few undergo progressive changes and mature. In the maturing follicle, proliferation occurs in the granulosa cells, representing the epithelial part of the follicle, and in the theca cells, the connective tissue cells which surround the follicle. The cytoplasm of the cells of the theca increases; the cells grow larger, polygonal, and take up the stain more readily. The capillaries of the theca proliferate and grow up into the granulosa. The granulosa cells, which in the quiescent state are cuboidal or low cylindrical, hypertrophy; they become higher, lipid accumulation takes place, and the whole granulosa zone increases several times in breadth. The capillaries from the theca enter the granulosa and the fine layer of lutein cells now already present, penetrating to the liquor folliculi. Some of the capillaries may rupture, thus increasing and staining the liquor folliculi. The whole follicle increases in size, comes from the depth to the surface of the ovary, and protrudes above the surface level; the albuginea and its epithelial layer are thinned and their capillaries are compressed; the granulosa cells of the discus oophorus become liquefied and finally rupture of the follicle takes place, setting free the ovum; ovulation has occurred.

The time of ovulation varies physiologically in different women and often in the same woman; while probably the thirteen to fifteen day type is the most frequent, variations from the eleventh to the twenty-third day after menstruation have been observed. Macroscopic observations made at the operating table, microscopic study of the ovary after extirpation, changes following artificial castration and the use of x-ray and correlation between the histologic picture of the endometrium and the period of intermenstrual pain, bring this last named phenomenon into relation with the process of ovulation and not, as formerly held, with an existing endometritis. The physical and mental condition of the woman; the condition of the albuginea whether thin or thick; inflammatory exudates around the ovary; mechanical irritations, as coition; and inflammatory conditions might explain the wider physiologic variations noted. Inflammatory processes of the basilaris of the endometrium, so-called endometritis, might change the normal cycle somewhat, but only to a certain extent. Inflammation might change the histologic picture of the decidua menstrualis as regards size and number of glands and quantity of secretion, but the clinical picture of the cycle is not necessarily considerably disturbed.

The rupture of the follicle suddenly changes conditions. The follicle cells of the granulosa and the ovum, which until now have been mutually interdependent and have reacted upon each other by osmosis and diffusion, become separated; they can influence each other

from now on only by way of the blood stream. With the rupture of the follicle, slight hemorrhage occurs into the follicle and into the peritoneal cavity. Of greater importance is the sudden growth energy, which manifests itself by great proliferation of the granulosa, and to a lesser degree of the theca cells, which is more of the nature of hypertrophy than hyperplasia. Lutein is freely accumulated, the epithelial cells of the granulosa being changed into lutein cells. Lipoids at this stage of the formation of the corpus luteum are not found in greater quantities. The organ thus formed is the corpus luteum. Its life is from twelve to sixteen days. At the end of the fifteenth day, which is the twenty-eighth day of the cycle, the corpus luteum is at the height of development.

During the existence of the corpus luteum no maturing of follicles takes place, no follicles rupture and the corpus luteum takes over their function as a gland. This repression is undoubtedly due to an hormonal action of the corpus luteum. While there are other conditions which have a similar repressive action upon maturing of follicles as anemia, tuberculosis or lactation, in which it would not be necessary to look for hormones as the repressive cause, the fact remains, that in the presence of a corpus luteum no maturing of follicles takes place.

With the death of the ovum, when not impregnated, regressive processes, fatty and hyalin degeneration set in suddenly in the corpus luteum, and sooner or later nothing but a corpus albicans is left as the remnant of the corpus luteum. With the appearance of degenerative changes in the corpus luteum, menstruation starts. Thus we approach the uterine cycle.

*Uterine Cycle.*—With the advent of the corpus luteum, changes take place in the mucosa of the uterus. During the first four days after the last menstruation the uterine mucosa is at rest, a state of quiescence exists. The remnant of the mucosa is very thin, three-quarters of the mucosa having been lost by the desquamatory process called menstruation, and nothing but a thin layer, the basilar membrane, is left to reproduce the new mucosa. By the end of the fifth day the basilaris is covered again by an epithelial layer. From the sixth to the fourteenth day after menstruation the mucosa grows, becomes three to four times thicker, the glands increase in length and are straight, and stroma is scant. There is no sign of function or secretion of the glandular cells. After the sixteenth day and more so after the eighteenth day, a rather sudden change sets in. Evidences of secretion are present, stroma cells hitherto quiescent begin to grow and hypertrophy, the glands begin to fold and convolute, and the cells are infiltrated by lipoids and glycogen. This process results in the formation of the decidua menstrualis, better



called prægraviditatis. These sudden changes in the endometrium coincide with the beginning of the formation of the corpus luteum, their height coinciding with its florescent state. While the stage of the proliferation of the endometrium coincides with the maturing of the follicle, the stage of onset of secretion, of folding of the glands, and of stroma hypertrophy, in short, the formation of the decidua menstrualis or prægraviditatis, coincides with the florescent state of the corpus luteum. The nest for the ovum in case of impregnation has been formed, the uterine mucosa has been transformed into the decidua prægraviditatis, there is ample secretion and ample nutrition for the ovum. If the ovum becomes impregnated, the corpus luteum proliferates still more and becomes transformed into the corpus luteum graviditatis. The decidua likewise proliferates during pregnancy. If the ovum dies, the corpus luteum rapidly regresses, degenerating by fatty and hyalin change until nothing is left but a corpus albicans. With the beginning of degenerative changes in the corpus luteum, menstruation sets in. Menstruation is certainly not the final purpose, not the goal Nature strives at. It is the acknowledged failure of Nature; it is an abortion of the unimpregnated ovum and the expulsion of the decidua prægraviditatis. Decidua formation is nothing less than a preparation for pregnancy, a nest formation for the ovum; if impregnation does not occur, the function of the decidua is ended. These processes are so regular and follow each other in such definite succession, that it is possible from the histologic picture of the corpus luteum to make conclusions as to the stage of the menstrual cycle. Postmenstruation and postpartum the endometrium offers a picture nearly analogous; there are, indeed, quantitative differences, but the only growth difference is at the site of placentation. Furthermore, it is nearly impossible macro- or microscopically to differentiate between the decidua menstrualis and the decidua graviditatis of the first few weeks after impregnation.

What has happened to the ovum meanwhile, from the time of the ovulation until menstruation? After rupture the ovum is carried along the fimbriated ends into the lumen of the tube. Here it remains for some time in a state of readiness and then, if not impregnated, dies. How long the ovum can live in the tube is not exactly determined, but theoretical conclusions are allowed. Some authors are of the belief that the ovum, after it has liberated the two polar bodies cannot live longer than two or three days, separated from the protecting granulosa cells; the latter constitute a necessary protection for such an active and energetic cell as the ovum, which through its energy would necessarily arouse reaction and surely attacks from leucocytes, plasma cells and chemicals. It is, nevertheless, most

probable, that the ovum can live for at least two weeks in the body, it carries its own nutrition, the vitellum, with it, and it is capable of taking up nourishment from its surroundings. Even after impregnation, at a time when it suddenly shows great activity and energy, the ovum can take care of itself for several days before it makes close connection with the maternal body.

If we further take into consideration that living spermatozoa have been found in the tubes thirteen days after coitus, and that in the bat, for instance, spermatozoa are found alive and active several months after coitus, we readily can see that we may speak of an optimum time for conception in relation to coition only in a rather wide sense. While it seems that the optimum time for conception would be just in the middle between two menstruations, it also is clear that coition soon after menstruation as well as a few days before the term for the next menstruation could be successful. An old Jewish law forbids coition for seven days after the last day of menstruation and the fertility of the orthodox Jews is well known.

In men, unlike in animals, coitus is not confined to "heat." Menstruation and heat have nothing in common. Heat and ovulation in animals are synchronous. It is the maturing of the graafian follicle that is the stimulus, in animals, for the preparation of the endometrium, and for the hyperemia of the genital organs. In the rabbit, for instance, at the time of heat the endometrium is already in a state of proliferation, which increases enormously after coition and conception with the formation of the corpus luteum and the formation of the decidua. The next two days see great growth and secretion in the endometrium; a decidua graviditatis is formed in the shortest time. In the rabbit, rupture of the graafian follicle most often takes place during coition. If coition does not take place, ovulation does not occur, the liquor folliculi is quickly absorbed, the granulosa and theca cells degenerate and the follicle disappears. The mucosa of the endometrium has up to this point not reached the height of decidua formation and therefore there is really nothing there for destruction, desquamation or cause for hemorrhage. There is no decidua formation, no preparation for nidation as in the human.

This is readily understood, if we consider how loosely the ovum is connected with the mucosa in the rabbit. Here the chorionic epithelium simply lies close to the epithelium of the endometrium, but there is no place of such close intermingling as in the place of placentation of the human. Man and monkeys have a specific position as regards hemochorial placentation. Most animals have an epithelial chorial placentation; after separation of the placenta there is hardly any, or no raw surface as in the human.

In the human being the correlation of ovarian and endometrial changes during the cycle may be summarized as follows: (Fromme.)

4th-15th day of cycle: graafian follicle attains maturity and, dependent upon it and the ovum, the proliferative phase in the endometrium starts.

14th-16th day: ovulation.

15th-28th days: corpus luteum matures to the florescent state and, dependent upon it and the ovum, the endometrium changes to the decidua prægraviditatis.

1st-3rd day: death of the ovum, degeneration of the corpus luteum and desquamation of endometrium—menstruation.

3rd-4th day: state of quiescence. Epithelization of the basiliary membrane, beginning growth of the graafian follicle.

What is the regulatory mechanism; what are the processes on which the sexual cycle depends? Until about twenty years ago all looked upon the ovary as the all important part of the generative organs, regulating the functions of the sex organs through nervous control. This theory of Pfüger, the theory of mechanical stimulation, for so long believed correct, was found incorrect, when Halban and Knauer showed that the ovarian and uterine cycle was not disturbed after transplantation of the ovary and severing of all nerve connections.

Since then we have learned that hormones play a part in the mutual relations between the genital organs as such and between them and the body. We therefore look upon the ovary not only as the reproductive organ but as an internal gland with an internal secretion, not only possessing the function of ovulation and the function of forming and controlling the female sex characteristics, but also the function of stimulating other organs, as the uterus and mammary glands to do their proper share in the reproduction of the species. I will merely mention the fact that a whole chain of endocrine glands has a hand in this function, the thyroid, hypophysis, pancreas, but it would lead too far to go into detail about the sphere and action of each of them.

To which tissue of the ovary can be ascribed the internal secretion, or which of the different structures of the ovary plays the important part? Three tissues are outstanding: first, the ovum with its surrounding follicle, and I am of the belief that it is fallacy to speak of them separately, since they are so closely related physico-chemically and morphologically; second, the corpus luteum; and third, the interstitial gland. Some authors believe the ovum, others the corpus, and another group the interstitial gland plays the leading rôle in regulating the sex life and the sex cycle.

I will speak first of all of the interstitial gland and its status in man.

Comparative histological examination of an ovary of a rabbit ten months old and of a girl sixteen years old, who had menstruated for one year, will give us quicker instruction, than all theoretical

arguing about this subject. In the ovary of the rabbit we see a comparatively large area of tissue stained with sudan, distinctly different from the surrounding tissue stained with hematoxylin. In the specimen from the ovary of the young girl the areas of sudan stained cells are very small and scanty. If we examine with the naked eye the cut surface of an ovary of a matured rabbit, we can see streaks and patches of yellow, formed by cells rich in lipoid and pigment; these cells rich in fatty globules and yellow pigment are the parts which take up the sudan stain. No such picture can ever be seen in the human, if we do not mistake a corpus luteum in the state of regression. The statement can be made, that microscopic examination of many ovaries from women during their active sexual life, pregnancy excluded, shows very little analogous to the well developed organ, which in other mammalia we call the interstitial gland. While in rabbits this interstitial gland at one time makes up about one-half of the whole ovary, in the human we cannot at any time of life call it an integral part of the ovary; it is a rudimentary organ.

Comparative histologic examination of ovaries of different mammalia (Aschner) shows that atresia of the follicles is the antecedent of the so-called interstitial gland, and that there exists a strict parallelism between the fertility, the number of the fetuses born at frequent partuses and the well formed interstitial gland. Those animals which have many young ones have a well developed interstitial gland. On the contrary, those with few offspring have a rudimentary interstitial gland. In man a well developed gland-like organ evenly spread over the ovary does not exist. The higher up in the animal kingdom we go, the more does the corpus luteum become the dominating factor and the more does the interstitial gland step into the background.

In the human ovary we find lipoid containing cells of the theca interna of atretic follicles, but never as a parenchymatous, well developed organ; there is only one exception and this is during pregnancy, during which atresia of follicles is rather commonly found. The question, whether ovulation occurs during pregnancy can in general be denied, but maturing of follicles does occur with subsequent atresia, after they have reached a certain size. The place of the interstitial gland in the human is taken by the corpus luteum.

How quickly our ideas of biologic principles change is best demonstrated, if we recapitulate the opinions about the corpus luteum, which have prevailed during the last twenty-five years. The corpus luteum was thought to be an unimportant product in a stage of degeneration. In 1899 Penant brought forward the idea that the corpus luteum possesses a mechanism which prevents ovulation. Then came Fränkel with his theory, that the corpus luteum is a periodical, four weekly, regenerating gland with an inner secretion, which prepares the uterine mucosa cyclically for the nidation of the impregnated ovum

and prevents climax precox. After impregnation the corpus luteum remains functional, a necessity for the growing embryo and a further stimulus for the growth of the uterus. If impregnation does not take place, the hyperemia of the endometrium leads to menstruation and the corpus luteum regresses. Fränkel showed that castration of the pregnant rabbit, done during the first six days after coition, will prevent or disrupt pregnancy. A great deal of weight in favor of Fränkel's theory was added by the experiments of L. Loeb, who was able by mechanical irritation of the endometrium of rabbits to produce a decidua-like formation, but only when a corpus luteum in a certain state of development was present in the ovary. In support of Fränkel's theory of the close correlation between corpus luteum and menstruation, he reported the observation, that in six out of seven cases he was able in women, after cauterizing the young corpus luteum, to prevent the next menstruation. But soon this theory found strong opposition. It was pointed out, that the endometrium shows proliferation at the time of the maturing of the graafian follicle, before ovulation and formation of a corpus luteum. It was further pointed out that in animals the corpus luteum bears no relation to the changes in the endometrium, or has such a relation only during a short period after ovulation. Oestrus, the height of the proliferation of the animal uterine mucosa, and heat are nearly identical in time. Of course, Fränkel comes back with the statement, that the enormously developed interstitial gland in animals acts vicariously for the corpus luteum, but this statement holds good only for a number of animal species. In the other animals with no interstitial gland, Fränkel is at a loss with his theory.

In my own experimental work, I was able to produce nearly all changes occurring just before heat by the injection of lutein extract in the presence of a functioning ovary. It would seem that the lutein extract alone could not stimulate the follicles. After castration the lutein had no influence upon the uterus or tubes, proving that the lutein alone was ineffective.

In another series of experiments I could prove that neither the injection of lutein extract, nor the successful transplantation of a corpus luteum into the abdominal wall could prevent the atrophy of the uterus following castration. I, therefore, would say that Penant's supposition, that the corpus luteum prevents ovulation during the time of its existence, seems well established. The corpus luteum continues and increases by hormonal action the stimulus exerted by the maturing follicle and ovum upon the endometrium, increasing this stimulus to a maximum, and through it transforming the proliferated mucosa into the true decidua prægraviditatis, with its lipoid secretion and cellular function. It continues this stimulus during the time of pregnancy. Concerning the correlation of corpus luteum

and menstruation, I lean much more to the opinion of Halban, Köhler and others, who believe that the corpus luteum exerts a directly retarding influence upon menstruation. This finds a very reasonable support in the findings of many surgeons, that frequently a few days following extirpation of an ovary with a corpus luteum, the operated woman starts to menstruate; and in the cases of unilateral corpus luteum cysts with amenorrhea and regular menstruation after extirpation of the cyst; and also in the observation of veterinary surgeons (cited by Ochsner) that not infrequently heat does not appear in cows, until a persistent corpus luteum is compressed and ruptured. Many cases of metrorrhagia of puberty are accompanied by small cystic changes in the ovary, but no corpus luteum can be found, therefore, the hemorrhages.

Experimental work with corpus luteum extracts, points to the fact, that these extracts have a direct action upon the uterus and its mucosa, but according to my own findings only in the presence of an ovary. Everything indicates that the ovum and the follicle regulate the ovarian and uterine cycle by their hormonal secretion; the corpus luteum increases this action through a specific hormone acting upon the uterus. After rupture of the follicle the ovum gets into the tubes or peritoneal cavity and is free from all connections with the body. Thus, freed from all connections, Seitz and others claim it would be impossible for the ovum to exert any further influence upon the body by hormone action; it dies and hence could not produce regression in the corpus luteum and menstruation. But we may answer to this objection, that we have to suppose that the hormones secreted by the ovum and absorbed by the mucosa of the tubes, are ferment-like substances, real enzymes or activators. If this be the case, there is no necessity that they have to be present in any appreciable amount.

In conclusion it can be said: Ovarian and uterine cycles stand under the omnipotent rule of the ovum and follicle. The ovum is the beginning and the end of all sexual function (Maier); it predestines in the early embryonal life the formation of the female organs and the female sex characteristics; later on all the general as well as the biologic changes during the period of active sex function are under its domain.

The true decidua prægraviditatis, a better name than decidua menstrualis, is the result of hormonal action of the corpus luteum.

Menstruation is a derailment, a result of a failure of Nature; it occurs when the ovum does not become impregnated.

Corpus luteum extract as on the market produces hypertrophy and hyperemia of the uterus and tubes, but only in the presence of ovaries. Theoretically its greatest therapeutic result ought to be expected in meno- and metrorrhagias and hypoplasias.

# Society Transactions

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## AMERICAN GYNECOLOGICAL SOCIETY

### FORTY-SEVENTH ANNUAL MEETING

WASHINGTON, D. C., MAY 1, 2, 3, 1922

*(Continued from November issue.)*

### Symposium on Obstetric Problems

DR. BENJAMIN P. WATSON, Toronto, Ont., presented a paper on **Further Experiences with Pituitary Extract in the Induction of Labor.** (For original article see page 603.)

DR. M. PIERCE RUCKER, Richmond, Va., presented a paper on **The Action of Ergot and Hypophysis Solution on the Uterus.** (For original article see page 608.)

#### DISCUSSION ON THE PAPERS OF DRs. WATSON AND RUCKER

DR. RUDOLPH W. HOLMES, CHICAGO, ILLINOIS.—I shall confine myself to remarks relevant to the paper of Dr. Watson. My practice has been to induce labor largely on two of his indications, namely, the toxemias of pregnancy, and distress, discomfort and insomnia which may be incident to the latter days of pregnancy. Up to ten years ago, very frequently, if there were minor cephalopelvic disproportions, I induced labor four weeks before estimated term. In later years the practice has been largely discarded. My impression is that I have had no untoward effects to mother or baby from such practice, done for pelvic indications. When done earlier, as was the vogue twenty years ago, the prematurity of 32 weeks or earlier brought an occasional disaster to the baby.

As regards the first indication, I wish I could reconcile myself to it. My teaching for many years has been that true postmaturity was an extremely rare event. We know not when pregnancy begins, therefore, we cannot definitely fix the day of confinement. In the classroom this graphic illustration is given the class: it takes 24 hours for a train to go from Chicago to New York. What time does it arrive? The astute student demands the time that it left the first city. So it is with the estimated date of confinement, ignorant of the moment of conception we have fallacies of our computation of the date of confinement.

I saw one woman in whom it was possible to determine the approximate time of conception within a day of the fruitful coitus. The first two pregnancies were characterized by a most distressing ptalism. In her third pregnancy ptalism appeared the day following her husband's return from a protracted absence. We all see many women who go beyond the calculated date of expected confinement. This is very different from a true protracted gestation. An overlarge baby does not attain this growth in the last week or two. The growth is progressively proportionate during the months of pregnancy.

DR. N. SPROAT HEANEY, CHICAGO, ILL.—Here we are considering methods of the induction of labor, and I think it must be conceded that the induction of labor is justifiable under certain conditions; also that there is such a condition as post-maturity, and that we need not consider how to arrive at these opinions.

My inaugural thesis before this Society was on pituitrin and ever since that time I have been much interested in its use and have had a great deal of respect for its action. After a lot of earlier difficulties, I discarded pituitrin entirely, excepting in the conduct of the third stage of labor. Some of our members recently advised "microscopic" doses of pituitrin, however, for the induction of labor and I have cautiously resumed its use for this purpose. One particular thing that has attracted my attention in the induction of labor is that frequently patients, after having been given quinin and more especially pituitrin extract, will suffer intensely and have hard pains without any progress. They may have intense labor pains for a considerable length of time and the pains will not produce any effacement or dilatation of the cervix. In other words, while pains may be produced, they may not be the proper kind of pains. Patients are now watched carefully after the giving of quinin or pituitrin and if no progress is apparent within a few hours, morphin is given the patient, and the indications for the induction of labor are studied anew. In this way I have obviated some of the disagreeable consequences of induction of labor and have saved myself much perplexity and my patients much suffering.

DR. ARTHUR H. MORSE, NEW HAVEN, CONNECTICUT.—We have been very much interested at Yale in Dr. Watson's previous papers upon the induction of labor by means of the administration of pituitrin. However, we have not quite dared to make use of it. I think in a previous paper Dr. Watson suggested that the drug would be useless as a means of inducing abortion. We have tried it in several cases of incomplete abortion to see whether or not it would cause expulsion of the retained placenta, but we have not been successful in accomplishing this. So it appears that our results confirm what Dr. Watson had already suggested.

I have been interested in Dr. Rucker's paper because he has attacked his problem from the standpoint of the pharmacologist. I have been wondering whether the curves which he obtained were due entirely to contractions of the uterine muscle; or whether an error crept in as a result of the contraction of the abdominal muscles. I shall be interested to hear from Dr. Rucker on that point. One interesting thing he has pointed out is this: the action of pituitrin is more marked toward the end of pregnancy than in the earlier months. Possibly other factors play a part here. Several years ago it was pointed out that the calcium salts appear to play a definite rôle in the causation of labor and in a series of cases which we have been studying, we have found an increase in the calcium of the blood toward the end of pregnancy. It appears possible that the activity of the pituitary extract in the later months of pregnancy may be bound up with this increase in the calcium content of the blood.

DR. CAREY CULBERTSON, CHICAGO.—Like Dr. Holmes, I am interested to know exactly what Dr. Watson means with reference to maturity or postmaturity, although I hesitate to bring up the question. We discussed this subject at length in the Chicago Gynecological Society a year or more ago, and arrived at no definite conclusion as to what these terms mean.

As regards the methods of Dr. Watson, in my own experience quinin and castor oil have been effective in a large number of cases, in fact, in a larger number of cases than in the series he has given here.

I have used pituitary extract as a method of induction of labor, very cautiously, and its use has been attended with no misfortune thus far. I have used rubber bags in a considerable number of cases and have had enough misfortune, so that



today I employ them, as Dr. Watson properly indicates, in relatively few cases, where conditions are favorable and the indications definite. I no longer use the bag for arbitrary induction of labor at term.

DR. WILLIAM C. DANFORTH, EVANSTON, ILLINOIS.—When Dr. Watson described his method two years ago I felt as I think other members did, that it was a method which should be approached with some conservatism. I have, however, tried it in a series of cases not so great as his, but have not had the boldness to use quite the same dosage. We have used the castor oil and quinin as indicated and have supplemented this by three minim doses of pituitrin every thirty minutes up to three times unless the patient were sooner in labor. Only once or twice has this number been exceeded. This we tried in about 25 multiparae and were successful in causing labor to begin in about 80 per cent. In none of these cases did we have any trouble traceable to the use of pituitrin.

We have, later, also tried it in a smaller number of primiparae with not quite so great a percentage of success. I have been very greatly interested in reducing the number of bag inductions, as I feel that any method which can offer a sufficient degree of safety and which will permit us to dispense with mechanical means is to be welcomed. We were able last year in 500 cases to reduce our bag inductions to nine, the bag being used only in case of placenta previa and toxemia in which we felt that rapidity of action was essential, and in some of whom castor oil, quinin and pituitrin had failed.

In some of these the action of the bag was disappointing. Where the bag is used only in cases which have failed to respond to less active methods, it necessarily is applied in cases which may be refractory to any means, hence its percentage of successes would be lower than in services where it is more routinely used.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIFORNIA.—Our results in inducing labor by castor oil and quinin differ so much from those of Dr. Watson that I would like to give them.

We became interested in this question several years ago and began to record our cases so that we might know what proportion of pregnancies at term went into labor following castor oil and quinin. About 350 of these were reported by Dr. Maxwell in an article which reviewed our induction of labor cases with bags. We now have nearly 500 cases of pregnancies at term, which were given castor oil and quinin. We give an ounce and a half of castor oil at 5 o'clock in the afternoon, and 5 grains of quinin an hour later, and 5 grains an hour thereafter. Labor followed in twenty-four hours in two-thirds of the primiparae and in three-fourths of the multiparae.

PROFESSOR W. L. WILLIAMS, ITHACA, NEW YORK.—I find obstetricians generally teach definitely regarding the duration of gestation. The veterinarian does not find that to be true at all in domestic animals. The period of conception is definite because copulation takes place only when the graafian follicle is mature, and just prior to menstruation should pregnancy fail to occur. In the various species of domestic animals the variation in the duration of gestation runs parallel with the average duration of gestation; that is, in some of the small animals the variation in duration of pregnancy is only two or three days. In the cow the duration of gestation varies from 270 to 290 days. In the mare it is from 300 or 330 up to 360 and even 365 days. The general impression is that the fetus grows rapidly during the final stage of pregnancy, and so veterinarians have sometimes thought of inducing labor in mares in which pregnancy seems too long, in order to avoid the excessive stress on the mother. The greatest duration of pregnancy I have observed in a mare was 365 days, and the young was a pigmy, so that excessive size of fetus does not always follow in prolonged pregnancy.

DR. FRED L. ADAIR, MINNEAPOLIS, MINNESOTA.—In 1916 I wrote a short article on the induction of labor with fractional doses of pituitrin, and have used the drug in uncomplicated cases since then. It was effective in uncomplicated cases, without rupture of the membranes, except in those patients who were at or near term. I used pituitrin then in doses not to exceed four minims at intervals of one-half hour, and if labor was initiated the pituitrin was stopped. On the other hand, if it was not initiated, it was continued until six or eight doses had been given. If you cannot start labor with small doses of pituitrin, it is better to cease administering it. We have also used castor oil and quinin. A safer method of administration is to begin by giving castor oil in doses from half an ounce to an ounce, depending on the individual susceptibility to the action of cathartics, at the same time giving five grains of quinin, and repeating the quinin in five grain doses, at intervals of four hours for four or five doses, unless the patient develops signs of cinchonism. In the cases in which there is no urgency in inducing labor, we try the castor oil and quinin, and if that fails, we try fractional doses of pituitrin, and if sometimes there is failure by these methods, we are warranted in using the more effective methods.

As to the useless suffering of the patients from the use of pituitrin, I have found that the bougie and bag are not always efficacious. These patients not infrequently have pains with the bougie and bag and when they are removed or expelled the pains stop. I think the objection raised by Dr. Heaney in regard to the use of pituitrin also applies to other methods of inducing labor, but perhaps in less degree.

DR. ALFRED B. SPALDING, SAN FRANCISCO, CALIFORNIA.—May I ask Dr. Watson what sort of quinin he uses for the induction of labor and in what manner the solution is given?

DR. WILLIAM E. DARNALL, ATLANTIC CITY, NEW JERSEY (by invitation).—In all this discussion on the induction of labor I have noticed that there has been a conspicuous absence of the use of the Barnes bag for the induction of labor, and I want to know from Dr. Watson if he has given up this method.

DR. WATSON (closing).—A good deal of discussion seems to center around the indications for the induction of labor in these cases, particularly postmaturity. We do not know what the duration of human pregnancy is. What I teach is, that if the pregnancy is prolonged beyond the calculated date of labor, that patient ought to be carefully observed every week at least, after she has passed term, and if there is any indication at all that there is a growing disparity between the head and pelvis, labor ought to be induced. In a great many of these cases coming under the fourth heading, distress is common, and those patients that go beyond term have that distress. There is in addition to that a great deal of inconvenience.

Regarding the postponement of labor, I have found this method so safe in such cases that I do not hesitate to use it. I do not for a moment think that all patients, who go beyond the calculated date of term, or the majority of them, really have postmature children.

With regard to the results obtained by quinin alone, Dr. Lynch mentioned his results, and possibly mine will correspond with his, but I do not wait twenty-four hours after quinin has been administered before I begin the administration of the pituitrin. Perhaps I am a little over-enthusiastic with pituitrin and cannot wait sufficiently long to see what the effect of the quinin is going to be.

Dr. Heaney remarked in regard to the suffering of these patients, and some one else stated that the same thing applied to the use of bags and bougies. I agree with them that in premature cases there is a great deal of distress, with no results,

and we cannot expect a result from quinin and pituitrin until there is opening of the cervix, and then labor will go on.

DR. KEDARNATH DAS.—I should like to ask Dr. Watson in connection with postmature cases, how many were primiparas and how many were multiparas?

DR. WATSON (resuming).—I have not the exact figures at my command, but a very considerable number of these were primiparous patients who had gone beyond term.

In reply to Dr. Spalding, the solution of quinin I use is quinin hydrochlorid, dissolved with 10 minims of hydrochloric acid to 10 grains of quinin. Patients object to the taste, but they are willing to put up with that with the prospect of a fairly rapid termination of their pregnancies.

In answer to Dr. Darnall, we use the bags and catheter or bougies occasionally, but we have occasional failures. If a bag is used the patient has pain, and when the bag is taken out the pain ceases. One-half c.c. of pituitrin administered at that stage will effectively start labor, and I think the use of pituitrin in such cases is a very good thing.

DR. RUCKER (closing on his part).—With regard to the question of Dr. Morse, in the first stage observations you can definitely identify the contractions. The uterine contractions are long wave-like contractions, while the contractions of the abdominal muscles are of the short up and down type. They are mere lines on the record. In the postpartum or third stage observations, where you get marked contraction of the uterus, there is a noticeable depression which is maintained for a minute or more. The same thing is done with the abdominal muscles, but for shorter intervals. The respiratory action of the abdominal muscles may mask a slight contraction of the uterus.

The thing that started us off was that ergot gave such slight results as compared with the action of pituitrin. We tried to measure the difference in the effect of ergot and pituitrin. If you use large enough doses, say three times as much ergot as the ordinary dose, you get a pituitrin-like effect.

Dr. Joseph Tabor Johnson in a paper on ergot presented before the Society in 1882, made the statement that mankind would be a great deal better off if ergot was abandoned. If that statement is true of ergot, what shall we say of pituitrin, which is a much more powerful drug?

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DR. GEORGE W. KOSMAK, New York, presented a paper on **Intrauterine Rupture of a Velamentous Umbilical Cord**. (For original article see page 619.)

#### DISCUSSION

DR. M. PIERCE RUCKER, RICHMOND, VIRGINIA.—Shortly after getting a copy of the program I had a case which may be of some interest to relate. It was a normal delivery. The cord was clamped; the patient started to bleed. I pressed on the abdomen, and about three or four inches from the vulva the umbilical vein ruptured and spurted blood all over the nurse. This case shows the ease with which these things may happen. There was no undue pressure made on the fundus.

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DR. ALFRED C. BECK, Brooklyn, N. Y., by invitation, presented a paper on **Is Interference Justifiable after Twenty-four Hours of Labor When No Other Indication Is Present?** (For original article see page 623.)

DR. RUDOLPH W. HOLMES, Chicago, Ill., read a paper entitled **The Test of Labor in Relation to Cesarean Section**. (For original article see page 579.)

#### DISCUSSION ON THE PAPERS OF DRS. BECK AND HOLMES

DR. REUBEN PETERSON, ANN ARBOR, MICHIGAN.—With regard to Dr. Beck's paper, it is the kind we ought to have more frequently, for the reason that it deals with a large number of cases treated conservatively. During the past twenty-two years we have been very conservative in the University of Michigan Maternity, in spite of the fact that I have been credited with being a radical in regard to eclampsia. I will say that in our clinic we find by actual experience that the morbidity and sometimes mortality is increased by early rupture of the membranes, consequently we were between two fires. We still went on with our conservative work, but the higher temperatures and morbidity persisted, consequently I welcomed with a great deal of pleasure Dr. Beck's low cesarean section operation, which I think is a great advance in obstetrics, in spite of the fact that Dr. Holmes has never done one and says he never will do one. Here is an operation where, if the test of labor fails, you can open the uterus low down with a minimum amount of trauma. Because of our conservatism, I have only done this operation five or six times. Technically, it is an easy operation to perform, and it is the kind indicated in the particular class of cases Dr. Beck has pointed out, where the woman has been in labor for a long time and is unable to give birth to the child. We do not use vaginal examinations in our clinic cases; consequently in cases where we do have to perform cesarean section we have not contaminated the vagina.

I have no criticism to offer in regard to Dr. Holmes' work with such an array of figures as he presents. We should have more time to study these figures. However, I cannot conceive of removing the appendix at a cesarean section. That is diametrically opposed to all good surgery, unless the woman has an acute appendicitis. Why should you contaminate the field with removal of the appendix in a cesarean section? It seems to me, the pendulum is swinging back to conservatism. It is necessary to go through this period of radical methods in order to swing back to sane methods, but surely that day is coming, and from now on we are going to give women in labor a chance, being ever ready to help them surgically, when necessary.

DR. RALPH H. POMEROY, BROOKLYN, NEW YORK.—As Dr. Beck's confrère in the Borough of Brooklyn, it would be unfair for me not to express myself in regard to this matter.

So far as publication is concerned, I suppose I am considered to be a reckless radical with dilating bags and perineotomies and rotation of posterior positions, instead of letting them alone, but I am not. I am ultraconservative and only want to apply my practice to the absolutely indicated selected situations, and I hope ultimately my apparent radicalism will simplify a few of the cases in which radicalism is indicated.

DR. N. SPROAT HEANEY, CHICAGO, ILL.—I want to congratulate Dr. Beck on the work shown, because if the spread of radicalism continues, there will be no place for the physiology of labor and the future obstetrician will have no experience on which to base the indications for his operations. I wonder at Dr. Beck's temerity in coming before the Society with such a study as the physiology of labor, in view of the radical tendency of the times.

I wish for the sake of his statistics, in order that they might stand out more

clearly, that Dr. Holmes had omitted the appendectomy. Though I, myself, have not removed the appendix during the course of a cesarean section, I cannot see any particular objection to it. It is largely a matter of viewpoint and much depends upon the individual case.

Dr. Peterson advises that all gallstone pathology should be attended to when met during operations for gynecological difficulties. I do not do this and I wonder at Dr. Peterson's objections to the removal of the appendix while doing a cesarean section in view of his radical advice regarding the gall bladder during gynecological operations. The conditions are, briefly, analogous. I am not saying that Dr. Holmes is right or wrong, but I can see no difference between the two recommendations.

DR. KADERNATH DAS, CALCUTTA, INDIA.—I desire to offer a few remarks on the question of prolonged labor and to draw attention to the fact that the first stage of labor may be prolonged with a low implantation of the placenta with intact membranes. These patients can be allowed to go on for more than twenty-four hours and then, if you make a vaginal examination and feel a soft cervix but the membranes do not bulge, in those cases after twenty-four or thirty hours the simple procedure of rupturing the membranes will quickly expedite labor. I should like to draw attention to that little point, although I do not know whether it is often done or not.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIF.—The results presented are checked by controls and without control checks our work will never be of a high scientific character. I am not able to discuss properly either paper, since I have not reviewed our material carefully, and I have long since learned that a discussion of a carefully prepared paper is not of much value, if you have not reviewed your own cases. We are too apt to be unduly influenced by the single cases which we keep in mind.

We see very few contracted pelvises in the far west which warrant cesarean section. Most of our dystocias are due to poor labor pains and bad flexions of the head rather than pelvic contractions.

Unfortunately, however, we have a comparatively large series of secondary cesarean sections, since in our part of the country there are many men who do cesarean section on very scant indication. Some do the operation once in every seventeen or eighteen labors. Many of these patients come to us in subsequent pregnancies. We treat them by cesarean since we feel that one cesarean warrants similar treatment subsequently.

Technic seems worth discussing since the cases that die usually succumb from infection. Although we do not make vaginal examinations as a routine even in normal labor, we do not believe that rectal examinations are invariably without danger of infection. Nearly 8 per cent of our cases have some slight fever following labors which have been conducted only by rectal examinations. There is no doubt, but that vaginal secretion from the posterior vaginal wall may be shoved into the cervix during rectal examination. Usually this is not of importance since streptococci are not often found in the pregnant vagina. Not all vaginæ, however, have bactericidal secretions. We, therefore, scrub out the vagina before the operation.

Personally, I do not feel that from the facts in hand we are yet able to advocate either the high or low cesarean. We know much about the high cesarean, and comparatively little about the low. Each man must be governed at present

by the results of individual series of cases. Since it is our aim to avoid or at least beat the infection, it seems that the choice of route is closely related to technic. Much depends upon the firm closure of the uterine incision. I do not feel that sufficient emphasis has been made of the fact that the uterine peritoneal membrane agglutinates in a few hours and, therefore, may limit a uterine infection. Therefore, proper peritonealization must be a basic consideration in any type of cesarean.

DR. BECK (closing on his part).—At the end of this study I had so many figures that they were very confusing. To avoid this confusion and make my points clear I, therefore, considered only the fetal deaths and maternal deaths in studying the end results. As Dr. Peterson suggested, in these long labors, particularly the dry ones, the temperature curve shows an increased morbidity. This is another argument against interference. If this increased morbidity is due to infection, operative interference no doubt would have increased the risk to the mothers by spreading that infection.

I have had considerable experience with the low incision cesarean section technic, and my results together with those of my friends were published a short time ago. Even though the series was small, I feel that we can say that the results are more favorable than would have been obtained had the classical high operation been used. We believe that the low incision properly peritonealized offers considerable protection against the extension of the infection to the peritoneal cavity.

With regard to Dr. Williams' work, I do not think that his observations on the uteri removed at operation proved conclusively that these uteri should be removed. Many of our patients undoubtedly had infected uteri and the great majority not only survive, but fail to have a serious infection. We, therefore, hope that with our technic we can gain the same result without adding the unpleasant symptoms which follow hysterectomy in young women.

For some time we have been making cultures of the amniotic fluid and placenta at the time of operation. We have been surprised to find streptococci present in not a few of these cultures. In spite of these findings the patients lived and did not have peritonitis.

DR. HOLMES (closing).—I thoroughly believe that Dr. Beck's paper by preaching conservatism is more important than mine. Yet, my experience and practice is based on a conscientious attempt to limit cesareans to the cases which demanded intervention at a time when high forceps, eventually craniotomy would surely have destroyed many babies. The whole basis of my paper is on personal experience, and I believe is more important than statistics computed on the results obtained by a questionnaire.

With reference to the removal of the appendix in connection with cesarean section, I cannot see the difference in the incidental removal of an appendix in this connection and its removal as an incidental step in ordinary gynecologic work.

My results speak for themselves. There were no deaths, and the composite temperature curves were just as favorable to the women subjected to it as in comparable cases where it was not done.

We may all agree with Dr. Lynch that rectal examinations may rub the vaginal mucosa with its normal bacterial content within the cervical ring, but it is infinitely less risky than the hazards of a vaginal examination, especially if the examiner does it in a slovenly manner.

DR. CHARLES C. NORRIS, Philadelphia, Pa., read a paper on **Pregnancy in the Tuberculous**. (For original article see page 597.)

#### DISCUSSION

DR. RUDOLPH W. HOLMES, CHICAGO, ILL.—I wish I could adequately express my appreciation of Dr. Norris' teaching regarding the coincidence of pregnancy and tuberculosis. Naturally, the obstetrician must leaven his opinions on this combination from the experience of those especially trained in tuberculosis work. My conviction is that if any good is to be derived from a therapeutic abortion in a woman afflicted with pulmonary disease, it must be done early. The more recent teaching is that pregnancy liberates certain ferments in the early weeks which tend to absorb albuminous deposits. The early tuberculous lesion is encysted. This ferment is presumed to absorb the retaining wall of the lesion, with the manifestation of a sharp reaction. How much of this explanation is to be proved by time may be debatable, but there is small use in doing a therapeutic abortion for tuberculosis after the third month.

DR. REUBEN PETERSON, ANN ARBOR, MICHIGAN.—I have had the same difficulty Dr. Norris has had in looking over the literature on the subject of tuberculosis in pregnancy and labor and the puerperium. I could not get anything very definite from the literature. That is why I welcome such a paper as this because Dr. Norris has had exceptional facilities in the Phipps Institute and has been able to collect a large number of cases and analyze them. He gives us definite information in regard to the effect of pregnancy on the tuberculous lesion. In my experience, which is limited, only having the cases as they come to the clinic and a few private patients, in tuberculous women who have insisted on continuing pregnancy and having their children, the latter have not been materially affected by the tuberculosis. Consequently my own experience agrees with the conclusions drawn by Dr. Norris. The transmission of tuberculosis to the child through the placenta is very rare.

As to the other point he brought out regarding the induction of labor, I think we have to consider each case separately. We have the problem of the child and the problem of the mother. If the mother and the husband look at it chiefly from the standpoint of the mother and ask that the uterus be emptied early in pregnancy, I think under some circumstances it is our duty to do it. On the other hand, beyond the fourth or fifth month of pregnancy, it seems to me, it is an entirely different question, and obstetricians have the life of the child to consider. This is backed up and strengthened by the statistics Dr. Norris has given us. These women do not do well when the uterus is emptied after the fifth month.

As regards sterilization, tuberculous women should be sterilized under some circumstances if they request it, and I am in favor of this procedure. I do not look upon the giving of a short anesthetic perhaps in the same light as does Dr. Norris. I judge its effects from my experience in anesthetizing tuberculous women with pelvic disease. In the advanced cases any form of general anesthesia acts badly. In the cases, however, that are not so far advanced, they stand a short anesthetic fairly well.

My conclusions regarding spinal anesthesia are about the same as those of Dr. Norris. Although I favor spinal anesthesia and have done it to a limited extent, I still have the same fear about it that he does. I think short anesthesia in women whose tuberculosis is not far advanced can be given and sterilization performed quite safely. This should only be done, however, after it has been explained to the patients that once sterilized they are always sterile, and that tuberculosis is a cur-

able disease. Later on in their lives, if they are cured, they may want a child. That is one of the serious objections to sterilization in this class of cases.

DR. RALPH H. POMEROY, BROOKLYN, NEW YORK.—There are two or three points on which I venture to comment. In doing vaginal or abdominal hysterotomy, which I have done on many occasions in this type of case, in the pulmonary cases particularly I have found it satisfactory to give deep, deliberate, morphin-scopolamin anesthesia, so that the patient's respirations were down to 10 or 12, and then have an expert anesthetist to give chloroform and oxygen in small quantities to the possible point of reaction and agitation on the part of the patient. I have never seen any serious consequences in carrying out operative procedure in this way.

Another comment I would like to make which is purely theoretical, and I do not know whether it has been considered or carried out or not, is with reference to the puerperium which is the serious side of the active progress in the tuberculosis case. The question arises can we accomplish anything by blood transfusion during the puerperium early, or in the progress of the case, to help tide these patients through?

DR. CARY CULBERTSON, CHICAGO.—Dr. Norris' very careful study is of a great deal of value, it strikes me, as far as it has gone, although it has been limited by the fact that it has been impossible to carry the study far enough to make it show exactly where the test comes in. In my opinion the test showing the influence of tuberculosis on pregnancy, labor and the puerperium, is the same as in heart disease, and that is by ascertaining how long these patients live. Information showing such data is not available, and that is where statisticians do not come to our aid. We should have a record of the ages at which 5000 women died of tuberculosis, and another large series of cases of 5000 women who have had one, two, three or four children, and the ages at which they died. We believe that tuberculosis shortens the life of the individual, and if it destroys the life of the mother earlier than it does that of the nulliparous woman, until we have statistics of this sort we cannot show the facts. It is unfortunate that such statistics are not obtainable.

DR. JOHN A. MCGLINN, PHILADELPHIA.—There was one point brought to my mind in discussing the paper of Dr. Norris, and that is the statement which Dr. Holmes made, which is not entirely scientific. I am not appearing before you as a missionary in any way, but the question was brought up in reference to the attitude which the Catholic Church assumed in not permitting Dr. Holmes to do craniotomy and insisting on cesarean section, and also the question of therapeutic abortion. We must realize in getting information as to certain beliefs that some theologians do not know theology any more than some historians know history. Oftentimes we are misinformed about certain beliefs and certain attitudes, but when you come down to the teaching of the church in reference to the question of fetal life, it is founded simply on the Fifth Commandment, "Thou shalt not kill." That is all there is to it. A prominent conception is that we must sacrifice the mother in the interest of the child. That is all nonsense. In Dr. Holmes' case you can no more jeopardize and threaten the life of the woman by doing cesarean section to save the child than you can do craniotomy to destroy the child and save the mother. Practically the only conflict we are up against, for instance, is in operating on our Catholic patients, and it is purely a question of abortion. It is not a question of the child being baptized. Baptism does not enter into the question. It is the rights of the child. Six months is the period of viability, and prior to viability operation cannot be done which will destroy the child. Scientifically, I think we believe now that craniotomy is hardly justifiable in the presence of a living child, inasmuch as we have operations which are just as safe or safer than craniotomy.

In these cases of tuberculosis associated with pregnancy, the question has not been



proved definitely whether a woman's chances are improved by abortion in the early stages rather than allow her to go to term. When you come to sift the thing down, a great deal of our trouble is the misinformation we have in regard to certain things. As I see it, practically the only conflict that exists between scientific medicine and theology at the present time is the question of the indication for therapeutic abortion. The teaching among Catholic patients is that abortion cannot be done prior to the viability of the child. I think scientific medicine has demonstrated up to the present time that there is very little indication for therapeutic abortion in cases of pronounced toxemia which can be properly handled and carried out. A great many cases of pronounced toxemia will die if the uterus is emptied, and if you have reason to believe that there is a conflict, do not accept the word of any person as to what the conflict may be, but seek proper information from those who are qualified to give it, and you will find you have very little conflict in the matter.

DR. NORRIS (closing).—I think that in presenting our paper I have not sufficiently emphasized our search of the literature which comprises an analysis of some 3000 cases. In studying the results obtained by others one is impressed with the results. This is, at least, in part due to the type of cases from which the studies have been formulated. The obstetrician, as a rule, sees the worst cases. The great majority of women are delivered by the general practitioner, or by midwives and early pulmonary tuberculosis is often not recognized by them, or if recognized, is treated along ordinary lines, provided the case does well. If, however, such a case suffers from an exacerbation of the pulmonary condition she is likely to be sent to a maternity hospital or consultation with an obstetrician is secured, and in this way swells the records of the latter. On the other hand, statistics from the interest contain many early cases which would not be recognized unless special diagnostic skill was employed.

We have endeavored to emphasize the necessity for the study of large groups and the fact that erroneous conclusions are likely to be arrived at unless this is done. Dr. H. M. R. Landis and other specialists in pulmonary tuberculosis have informed me that, as a rule, when exacerbation in the pulmonary condition occurs as the result of pregnancy, these are likely to become manifest in less than three months, and this seems to me, logical. All our cases have been followed for at least three months after delivery and many for longer periods, some as long as thirteen years.

As to the question of transfusions, this is very pertinent. I think it an excellent suggestion and hope to employ it more frequently in the future.

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## THE OBSTETRICAL SOCIETY OF PHILADELPHIA

*STATED MEETING MAY 4, 1922*

THE PRESIDENT, DR. STEPHEN E. TRACY, IN THE CHAIR

DR. JOHN C. HIRST AND DR. CHARLES MAZER presented a paper on **The Rubin Test and Its Therapeutic Application**. (For original article see page 628.)

### DISCUSSION

DR. JOHN COOKE HIRST.—We have not yet examined a sufficient number of cases (the number now being slightly over seventy) really to form conclusions more definite than those that have been stated. Dr. Reuben Peterson, who reports the

largest series of cases, has drawn very much the same conclusions. I have watched most of these cases that have been under our care and have not seen a single unfavorable reaction, especially since the use of carbon dioxide. Up to that time there was considerable pain produced by oxygen injections and I have had no experience with the use of atmospheric air, but I rather think that the same pain would be present. As soon as we changed to carbon dioxide the difference was noted at once. At first we used the fluoroscope in every case, but we find that unnecessary now. While using oxygen the therapeutic test of pain was quite remarkable. We would not tell these patients what to expect, but as soon as they got down on the table they would begin to work and rub the right shoulder. That pain is almost entirely lacking when carbon dioxide is used and as far as any pelvic irritation is concerned we have not as yet seen a single case. Of course the method has to be adapted to those cases in which there is no chronic cervicitis, no chronic leucorrheal discharge, and no evidence of pelvic disease. With a little care in all cases I believe that we need not fear any septic reaction in the use of this method, which has certainly saved us from making quite a number of mistakes. A case in point is a patient who came to my office with a diagnosis of sterility; she has had corpus luteum, she has had ovarian and every possible extract. She has been curetted four times in the last year by different men and in our clinic the Rubin test showed, after 60 c.c. of gas introduced into the uterine cavity, that her tubes are absolutely closed. What is the use of treating that patient except to reopen the tubes, with very questionable result? My experience with reopening of the fallopian tube is very unfavorable. Very few pregnancies have resulted and a large proportion of them have proved extrauterine. I doubt very much whether the intraabdominal opening of the fallopian tubes is going to justify itself.

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DR. ALFRED HEINEBERG read a paper entitled **An Improved Method of Supporting the Bladder and Vagina After Vaginal Hysterectomy for Prolapsed Uterus.** (For original article see page 634.)

#### DISCUSSION

DR. JOHN M. FISHER.—From Dr. Heineberg's description I do not consider it or the Goffe operation any better than that which I have been doing for a number of years. While patients do not always return after leaving the hospital for examination and frequently drift into other hands, yet, in those that have come back I have invariably found a deep vagina and the bladder well supported.

The operation is very simple: I do an elliptical resection of the anterior vaginal wall, push off the bladder to the peritoneal reflection, then encircle the cervix with an incision, push off the mucous membrane front and back, ligate the lower segments of the broad ligaments in sections, and allow the stumps to retract. Next I incise the peritoneum anteriorly and posteriorly, deliver the fundus of the uterus through the anterior opening, ligate the infundibulopelvic and round ligaments *en masse* on one side, grasp the ligated structures on the pelvic side of the knot with a Kelly hemostat, and sever the structures well in advance of the ligature, thus freeing the uterus on one side, leaving the hemostat on the stump for later traction. The opposite infundibulopelvic and round ligaments are now easily dealt with in the same manner, thus completely severing the uterus from its attachments. After the removal of the uterus I bring down the ligament stumps by traction with the grasping hemostats and attach to them the upper angles of the vagina on each side formed by the previously resected anterior wall. The peritoneal opening left by the removed uterus is now closed with a purse-string suture in such a manner as to

leave the stumps extraperitoneal. The hemostats are now removed, permitting the ligament stumps with the attached vaginal angles to retract to the side of the pelvic wall. The elliptical gap in the anterior vaginal wall and the vaginal vault are closed with a continuous suture. A triangular resection of the pelvic floor with suture of the levator muscles and perineum complete the operation.

I have frequently demonstrated that the existence of a true cystocele, in the vast majority of cases of uterine prolapse even in pronounced cases, does not exist and that the complicated operations devised for the support of the bladder with atrophied broad ligament structures, at best are unnecessary. In a downward displacement of the uterus the base of the bladder necessarily is dragged down with it while the longitudinal tension of the vaginal wall becomes relaxed and by losing its close connective tissue attachment to the bladder the latter prolapses and presents itself in the form of a protruding pouch that in a large proportion of cases could be transfixed at the base without touching the bladder base. Push the uterus back in these cases to its normal position and you restore the bladder base while the vaginal prolapse (so-called cystocele) persists. To correct the conditions present, first do an elliptical resection of the redundant vaginal structure and then restore the uterus to its normal position by giving it proper support from below (perineorrhaphy) and by a properly adapted intraperitoneal procedure on its ligamentous structures. In cases demanding vaginal hysterectomy I do the operation previously described.

True cystocele occurs in the aged and depends upon a relaxation but more especially upon atrophy of the pelvic structures in general.

As a result of the disappearance of the loose connective tissue elements between them, fusion of the vaginal and vesical walls takes place so that the anterior vaginal protrusion presents itself in the form of a smooth, glistening, thin-walled pouch without muscular or facial support. These are the cases in which the interposition operation gives the best results while in cases demanding vaginal hysterectomy I have found the Goffe method the more logical procedure, although, owing to the atrophic changes affecting all the pelvic structures even this frequently fails to secure the desired vesical support.

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DR. PHILIP F. WILLIAMS read a paper on **Postabortal Hemolytic Streptococcemia**. (For original article see page 636.)

#### DISCUSSION

DR. JOHN COOKE HIRST.—I have used serum in my own work and in conjunction with other work in the University Hospital. Our work began in the old days when we depended upon the Marmoreek serum, which, as you know, was not successful as it had to be transported. We used doses which were ridiculous, annoyed the patient and did not do her any good. Our results are now better; we have had a number of these cases at Mt. Sinai, but I feel the use of serum should be confined to the cases with positive blood cultures. I do not think that in cases where the infection is not yet known it should be used, but where the blood culture proves the presence of streptococci, where the serum is given early and in sufficient doses, the results have been exceedingly encouraging and in some cases almost magic. We begin with an initial dose of 150 c.c. and I believe that Dr. Williams' doses were not large enough. I understood him to say that in several cases only 50 c.c. were given at a dose. The serum should always be given intravenously. It should be preceded by desensitization of the patient. We give 150 c.c. daily for the first three days and then a few doses of 150 c.c. are given often enough to terminate

the course of the disease if there has been improvement by the first treatment. The largest amount given that I can recall was 900 c.c.; the average dose, I think, runs between 450 and 600 c.c., but the use of serum in the cases where the blood cultures are negative is also useful. Recently in the University Hospital we have been experimenting with the intravenous use of mereurochrome. There have not been enough cases to formulate any particular idea about it, but it seems to be of distinct benefit. Its use is always accompanied by an immediate and rather violent reaction, which is followed by rapid improvement, but is not of long duration. We believe that while it does not cure the patient, it very markedly aids her to get well and shortens the duration of the illness in that way.

I feel insofar as serum is concerned, if given in sufficient doses, early and intravenously, especially where the blood cultures give positive result, almost always improvement can be looked for and in many cases the cure is almost magical.

One word about blood transfusion: the repeated transfusion of moderate amounts and the massive transfusion. Of the two, the massive transfusion has, in my hands, proved much the more desirable. A single transfusion of 750 c.c. up to as high as 1100 c.c. has given much better results than repeated small transfusions.

DR. CHAS. MAZER.—A valuable adjunct to antistreptococcic serum in these cases is blood transfusion. It is our experience at the Mt. Sinai Hospital that the transfusion of blood does as much good as the antistreptococcic serum. We use the direct method and give as much as 1300 c.c.

We recently had at the Mt. Sinai Hospital a case of septic abortion with a positive blood culture. There was no appreciable improvement after 1050 c.c. of serum, and we resorted to the use of neosalvarsan with a very happy result. Four injections were given within a period of two weeks.

I wish to say a few words about desensitization of the patient as a preliminary to the administration of antistreptococcic serum. We have had such uniformly good results in the use of this agent, that we became rather careless in our method of administration. One of my patients had a severe postpartum hemorrhage with a marked rise in temperature on the third day after delivery. As the temperature continued for several days, I administered 100 c.c. of serum without desensitizing the patient. She died of anaphylactic shock within four hours. Since then I never administer serum without desensitizing the patient.

DR. J. O. ARNOLD.—A recent experience with two of these cases calls to mind the importance of early diagnosis and early use of serum. Large doses, 250 c.c., intravenously failed to produce any reaction whatever and death resulted. So in a questionable case, a blood culture should be made much earlier than is usually done.

DR. GEORGE C. HANNA.—I have three acute cases in mind who were transfused. All died. I have seen good results in the subacute type. My experience in treating septic cases with the various serums has been disappointing. I have obtained just as good results with horse serum for it is really the antibodies that do any good.

DR. JOHN M. FISHER.—In cases of retained decomposing decidua with good uterine drainage, I consider it bad practice to interfere with the uterus as a routine measure. Where curettage in such cases has been done I have time and again observed the patient have a chill followed by a higher temperature than before, in addition to other evidences of a previously localized condition having become a generalized blood infection. The doctor stated that the bacteriologic examinations of the discharges in his cases revealed the presence of streptococci. This is practically true in all cases of abortion with retained necrotic material but it does not prove that a given patient had a blood infection or that she would be any the less exposed

to such contamination by localized interference, or that she would have failed to make a satisfactory recovery under the expectant plan. I am sure that most of you here regard chills and a high temperature in the puerperium with more apprehension if these symptoms occur in the presence of a clean uterus than when they are associated with an offensive, saprophytic discharge. The former invariably is an indication of a blood infection, whereas the latter usually is dependent upon the localized condition in which the symptoms subside when the uterus is emptied of its contents. The fact cannot be too strongly emphasized, however, that nature's method of emptying the uterus is accomplished by a reactionary protective zone of cellular infiltration that gradually brings about a separation of the overlying necrotic material, while a resort to instrumental means not alone removes the dead tissue but destroys the protective zone as well, thus exposing blood and lymphatic channels to direct invasion by septic microorganisms. That a certain proportion of cases are relieved of all symptoms and go on to a rapid convalescence after instrumental interference, merely indicates an arrest of toxins depending upon necrotic putrefaction while those growing profoundly worse and often dying after a curettement are an evidence of bacterial blood invasion that is altogether too frequently regarded as a mere coincidence rather than as a consequence of the localized interference.

Concerning the serum treatment of puerperal sepsis, my own experience has been far from convincing. Considering the erratic tendencies of the disease depending upon the variability of the toxic properties of streptococci in particular, it is rather difficult to formulate observations of dependable value unless cases are studied in very large groups. At times I have been favorably impressed with its effects in individual cases but have been equally as often disappointed. Most of these cases recover in spite of all forms of treatment or no medical treatment at all, some within a week, others after several weeks, and still others linger for months and may develop all manner of septic and pyemic complications. The whole subject is still veiled in obscurity. I still hold that good food, salt solution by the rectum, open air exposure, and a good whiskey (stressing the word good) especially in cases with failing circulation and low typhoid states, are among the most valuable adjuncts in the treatment of this dread disease.

Of course if I am brought in contact with a patient with material protruding from the cervix I take a placenta forceps and pull it out, but this is altogether a different procedure from indiscriminately curetting every case.

DR. G. VICTOR JANVIER.—I trust I may be pardoned for injecting a few remarks which may not be directly germane to the discussion. After ten years in this work, I have not been able to understand why the general practitioner and why the student get the idea that dilatation and exploration, or dilatation and curettage, is an easy, harmless thing, that can be done in any hovel with the woman cocked up on the edge of the bed and her knees anchored up against the backs of two chairs. Today I approach exploration with more trepidation and fear than I do a typical pus tube, because nine times out of ten, the uterus is soft and flabby and thus easily perforated by careless instrumentation. I think too, we have awakened to the fact that we must now teach the general practitioner and primarily our students, that a dilatation and curettage should not be done in a private house. I have seen men invade the uterus with as little aseptic technic and as much abandon, as in lancing an abscess.

DR. THEODORE A. ERCK.—In former years we did not know much of streptococci or of blood examinations. At that time something was available that is unavailable today, namely good whiskey. Wouldn't it be a fair test for the man who employed antistreptococcic serum to treat an equal series with good whiskey,

giving at least an ounce every hour and if necessary for several days? I have seen several such severe cases and I am sure that is the only thing that saved them.

DR. STEPHEN E. TRACY.—I would like to ask Dr. Williams whether he can tell us what to do with the cases of staphylococcus infections.

DR. WILLIAMS (closing).—I reported these cases because they were the first cases of hemolytic blood stream infections in the service at the Presbyterian Hospital in several years' time. We do not get them very often. Sometimes we get streptococcus, but very seldom the hemolytic streptococcus. In the ordinary case of abortion I do not see that there is any harm in cleaning out the contents of the uterus. In these cases the first one had nothing done to her at all so far as operation is concerned. The other three cases were more or less considered as being in the nature of incomplete abortions and the uterus was explored more for getting rid of hemorrhage than for foul odor or to bring down temperature. We consider hemorrhage as a complication and when severe enough we decide to remove the irritation which is possibly causing the hemorrhage. We have a blood culture made on all cases that came in that look anything like blood stream infection. These were illegitimate abortions, but the third case evidently had the blood stream infected before admission. The reason for this is that so many of these women harbor the hemolytic streptococcus normally in their cervical canals. The hemoglobin percentages were not low enough to warrant transfusion though the latter may be therapeutically useful in streptococcic cases.

# Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

## Selected Abstracts

### Fetus and Newborn

**Bartram:** *The Interpretation of Fetal Heart Sounds.* *Zeitschrift für Geburtshilfe und Gynäkologie*, 1921, lxxxiv, 34.

The author accepts the prevailing opinion that slowing of the fetal heart rate during labor is due to decreased placental respiratory interchange during the pains—particularly the expulsive pains. This leads to an increased carbon dioxide content of the fetal blood with vagus and vasomotor stimulation, causing a decrease in the heart rate and increase in blood pressure. The significance of uncomplicated acceleration is still under dispute, notably Seitz claims that it should not be considered a sign of asphyxia, yet acceleration following a period of slowing is rightly considered a most serious symptom and is probably due to vagus paralysis. In certain cases the slowing may be due to direct brain compression, whether by the pelvis, rigid maternal soft parts or instruments. In some of these cases the compression may be only transient with a later return to a normal status. In others a state similar to concussion of the brain in adults may give rise to transient cerebral symptoms for some days after birth, though respiration is normally established at birth. In certain of these cases of transient asphyxia, premature respiratory efforts in utero may result in the aspiration of so much mucus that resuscitation of the child is impossible, though its intrauterine heart activity may seemingly have been reestablished at a normal level.

MARGARET SCHULZE.

**Bylicki, L:** *Contributions to Fetal Biology.* *Gynécologie et Obstétrique*, 1921, iv, 541.

The author gives a short consideration of the mechanism of deglutition in the fetus. He thinks the naso-pharyngeal cavity becomes filled with amniotic fluid and that the fluid is swallowed and replaced by other fluid. He also speaks of the aspiration by the fetus of amniotic fluid. He considers it especially from the standpoint of asphyxia in the newborn. Since we do not find amniotic fluid in the respiratory passages of the newborn, he considers unnecessary some of the customary maneuvers for the resuscitation of the newborn. F. L. ADAIR.

**Ganssle:** *Sex Determination and War.* *Zeitschrift für Geburtshilfe und Gynäkologie*, 1922, lxxxiv, 159.

The author reviews the theories of the transmission of sex and the numerous explanations offered for the ordinarily slight preponderance of male children over female children at birth. He refers to the well-established idea that many more male children are born during and immediately following a war, and analyzes the various factors which have been supposed to exert some influence, such as age and parity of the mother, nutritional conditions, etc. He finds, how-

ever, that a careful analysis of statistics of large series does not show an actual preponderance of male children, but that this appears in some series merely as the percentage variation found when an insufficient number of cases are considered.

MARGARET SCHULZE.

**Vignes, Henry:** *Signs of Death in Utero.* *Le Progrès Médical*, January 8, 1921, p. 17.

Vignes finds that in the early months of pregnancy the cessation followed by a sudden return of nausea and vomiting is very suggestive of fetal death. Likewise are the appearance of a true lacteal secretion, the failure of a progressive enlargement of the uterus, or a uterus which is not in accord with its estimated size, suggestive of the same misfortune.

He finds that hydramnion, syphilis, high acute fevers or nephritis, when complicating a pregnancy, are often the etiological factors of fetal death and, when present, the case should be regarded with this possibility in mind. The more definite signs during the later months are cessation of fetal movements and cessation of the fetal heart. However, too much stress must not be placed on either of these findings unless obtained at several subsequent examinations. Another important sign is crepitation of the bones of the fetal head upon either abdominal or vaginal examination.

So long as no infection is present Vignes advocates letting the patient go into labor and expel the products of conception spontaneously. However, when other pathology is present, it may become necessary to resort to more drastic measures.

THEODORE W. ADAMS.

**Liegner:** *Intrauterine Rigor Mortis.* *Zeitschrift für Geburtshilfe und Gynäkologie*, 1921, lxxxiii, 401.

Intrauterine rigor mortis was first described by Ehrmann in 1842. It has been recorded only rarely; the author was able to find 32 cases in the literature. He believes, however, that for many reasons it is frequently overlooked, since Wolff in 6 years encountered 4 cases, and he personally observed 3 cases in one year. It develops and disappears more rapidly in the fetus than in the adult, in one case born 11 hours after intrauterine death, the height of the condition had already been passed. Fever, eclampsia, and chloroform narcosis are factors which may accelerate the development of the condition. It is of considerable clinical importance, since the loss in flexibility of the fetal body may delay the mechanism of normal labor and increase the difficulties of operative intervention.

MARGARET SCHULZE.

**Blumenfeld:** *Congenital Abdominal Ascites with other Abnormalities.* *New York Medical Journal*, 1921, cxiv, 417.

The author reports a case of dystocia in a multipara due to marked abdominal ascites of the fetus, associated with a number of other congenital anomalies.

MARGARET SCHULZE.

**Tennent, Robert:** *Exomphalos, or Hernia into the Umbilical Cord.* *British Medical Journal*, February 19, 1921, No. 3138, p. 263.

This condition may be so extreme that the greater part of the abdominal organs are contained in a sac at the umbilical attachment of the cord. It is more commonly a globular swelling about the size of a tangerine orange. Extreme cases are not susceptible of treatment. Those of more moderate degree are suitable for operation. Ballantyne has definitely defined exomphalos as true



hernia of the abdominal contents into the umbilical cord. He distinguishes it from a ventral defect in the abdominal wall to which condition he gives the name gastroschisis. Other names have been applied to this condition.

Frequency according to the various authors is one in from 2000 to 6000 births. The covering of the hernia consists of three layers, amnion, Wharton's jelly, and peritoneum. Sometimes the skin of the abdominal wall is continued some distance on the swelling. The swelling usually contains some portion of the intestinal tract and not infrequently a Meckel's diverticulum. The contents are usually irreducible. There is often intestinal obstruction and even complete strangulation. Fatality usually results from intestinal obstruction or peritonitis. Treatment: Immediate operation. The operation consists of opening the sac, separating it from the contents and returning the contents to the abdomen. The vessels of the cord are carefully ligated at the neck of the sac. If the bowel is gangrenous the outlook is hopeless. Meckel's diverticulum if present should be removed. Appendicostomy can be done in some cases. The author reports 5 cases, 4 recoveries and 1 death. Etiology: Possible factors are abnormalities in fetal position; hydramnios lordosis in fetus; unduly short cord; developmental defect of skin or mesoblastic layer of abdominal wall; functional defects due to trophic disturbances, fetal dropsy.

The most likely cause in the writer's opinion is a developmental or functional defect of the mesoblastic layer of the abdominal wall. Treatment to be successful must be immediate. Operation is preferable.

F. L. ADAIR.

McAuslin, J. T.: "Harlequin Fetus" (Hyperkeratosis Congenitalis). British Medical Journal, Jan. 29, 1921, No. 3135, p. 155.

This is a short article published with a plate. Mother 16 years old. Full time fetus stillborn. Weight seven pounds. The skin was dead white, cornified and cracked in all directions. The skin changes were universal. The hardened scales were removed and a red raw looking surface was exposed. The eyes showed no differentiation into iris, etc, and appeared as two blood filled sacs. On autopsy, the internal organs were apparently normal except the thymus which contained numerous scattered abscesses. No definite evidence of syphilis in mother or fetus was made out. This condition should be distinguished from ichthyosis by the fact that it is present at birth, while the latter condition appears toward the end of the first year; also by its distribution which is general while ichthyosis is rarely widespread at first; by the fact that it always affects the palms and soles which ichthyosis hardly ever does.

F. L. ADAIR.

Dacharry, Norberto A.: Resuscitation of Newly-born Child Without Heartbeats by Intracardiac Injection of Adrenalin. *Semana Medica*, Buenos Aires, 1922, xxix, 135.

The author has been unable to find in the literature any report of the use of adrenalin in resuscitating the newborn. The case reported by him concerned the delivery of the child of a woman in labor at term in her ninth pregnancy. Her previous labors had all been difficult ones, five children having been extracted with forceps, of whom one was stillborn, two died within 24 hours, and two lived; the remaining labors had been spontaneous, and one child thus born had died in twenty-four hours.

The present labor showed marked dystocia, and after seventeen hours of labor with membranes ruptured, the head had not engaged. Forceps were applied but the head could not be brought into the pelvis, and a version was de-

cided upon. As the breech was brought down, the cord came down with it. The head was brought into the pelvis only by the use of very strong suprapubic pressure, and was delivered from the pelvis by forceps.

The child was born in asphyxia pallida, and no heartbeats could be elicited. The cord was cut, and a syringe of 1 or 2 c.c. capacity containing 1/3 of one c.c. of 1:1000 adrenalin, with a needle 3 cm. long and 0.5 mm. caliber was prepared for the injection. This was made in the fourth left intercostal space about 12 mm. inside the nipple of that side, and the needle inserted half a centimeter. About a minute and a half later the heart was felt to beat energetically, and ten minutes later, after warm bath, artificial respiration, etc., the baby breathed spontaneously.

Baby lived nine days. Autopsy showed subdural hemorrhage, heart and pericardium normal, with no trace of needle puncture. THOS. R. GOETHALS.

**Kirstein:** A Remarkable Biological Peculiarity of the Newborn. *Deutsche medizinische Wochenschrift*, 1921, xlvii, 1393.

Not only Kirstein but other investigators as well, found what they considered Loeffler bacilli in from 23 to 85 per cent of all newborn babies examined. Only a few showed clinical signs of diphtheria. These cases usually run a very mild course and are, therefore, easily overlooked. On account of the difficulty, if not futility, of immunizing the newborn, an attempt was made to immunize them by the injection of toxinantitoxin into the mother. Of the children from 263 mothers thus immunized, 4.6 per cent had diphtheria infections, while only 4.4 per cent of the children from 661 mothers not immunized showed such infection. This seems to prove that acquired immunity against diphtheria is not transmitted from mother to child. Kirstein has the impression that the administration of antitoxin has no specific curative action in the newborn, though he advises the continuation of its use until the matter is further cleared up.

R. E. WOBUS.

**Schubert:** The Etiology of Birth Palsy. *Zentralblatt für Chirurgie*, 1922, xlix, 363.

Schubert takes up briefly some of the theories advanced about the etiology especially for brachial paralysis. Since this form of birth palsy is often associated with paralyzes of muscle groups not innervated by the brachial plexus, he feels that the trouble must be central. He thinks that most of these paralyzes can be ascribed to developmental defects but gives no conclusive reasons for his theory. Instead of ascribing them to birth trauma, he classes them with such developmental defects as congenital hip joint dislocations and foot deformities.

R. E. WOBUS.

**Platt, Harry:** Birth Paralysis. *British Medical Journal*, Nov. 26, 1921, No. 3178, p. 885.

The author considers only that type of lower neuron paralysis of the upper limb seen in the newborn and due to definite injury during delivery. From the available statistics, he considers that about 4 result from vertex presentation to 1 from breech presentation. It is occasionally associated with traumatic lesions and external mastoid hematoma or fracture of the humerus or clavicle. The author takes up early and later symptomatology. He considers the treatment under three heads: (1) Early postural treatment. The injured limb should at once be fixed in the position of abduction and external rotation at the shoulder, the elbow flexed, the forearm supinated and the wrist dorsiflexed.

Further treatment consists of continued splinting with daily passive stretching of the shoulder joint. (2) Operative exploration of the brachial plexus. This should not be done under nine months in any case. It is rarely needed and may not even be feasible. (3) The treatment of the contractures. This consists of the reduction of posterior subluxation with the internal rotation contracture by means of a single manipulation under anesthesia. This procedure is often difficult in children over one year and usually fails in those over two years.

F. L. ADAIR.

**Leroux, Robert:** Otitis in the Nursling and the Newborn. *La Presse Médicale*, December 17, 1921, No. 101, p. 999.

Otitis occurs quite frequently in the nursing infant and not infrequently results in pyemia and meningitis. Leroux thinks the otitis is somewhat different in the nursling from that in the adult. There are certain anatomic considerations which favor the development in the newborn and in the nursling. Paracentesis tympani without delay is an important therapeutic measure. He thinks it may be caused by the aspiration of material at the time of birth. The ears as well as the eyes in the newborn should be protected at the time of birth. The nasal fossae should be vigorously disinfected at the time of confinement and on the following days.

F. L. ADAIR.

**Liebe:** Gonococcal Skin Lesions in the Newborn. *Deutsche medizinische Wochenschrift*, 1921, xlvii, 1590.

While the gonococcus ordinarily affects only mucous membranes, it may, under certain conditions, attack the delicate skin of the newborn as the following case shows. A child was born without difficulty in left occipito-posterior position. Four days after birth, vesicles developed on the left thumb which contained a cloudy, serous exudate. These gradually spread to two fingers. At the same time small vesicles appeared on the right cheek, gradually involving part of the face and scalp. All vesicles contained gonococci in pure culture. The lesions were checked after 14 days, being treated at first with 1 per cent and later with concentrated solution of silver nitrate. Epidermization was complete after another 14 days. An extension to the eyes was prevented by daily installation of silver solution.

R. E. WOBUS.

**Turnbull:** Congenital Syphilitic Inflammation of the Long Bones. *Lancet*, 1922, ccii, 1239.

Syphilis in the fetus or in infants may give rise to inflammation in the diaphysis, at a distance from the epiphysis, or in the periosteum. More commonly it causes inflammation in the diaphysis at its junction with the epiphyseal cartilage.

The curtailment of the normal vascular supply causes portion of the epiphyseal cartilage to degenerate. The line of junction of the epiphysis with the diaphysis appears dentate. As growth proceeds, the level at which provisional calcification should normally take place may reach the transverse chondral vessels. This leads to the occurrence, in the epiphyseal cartilage, of red streaks and dots which are each bordered by a narrow zone of yellow calcification. As this progresses a more remarkable appearance is produced—a yellow, usually irregular, line of provisional calcification is followed by a zone of red marrow, in which osseous trabeculae can be felt with the point of the scalpel, and this red marrow is separated from the red diaphysis by a second, the original-yel-

low abnormally deep, zone of provisional calcification. Fibrosis is seen with the microscope in all but the earliest and slightest lesions.

Syphilitic diaphysitis occurs with considerable frequency in the medulla of the diaphysis. The fibrosis is associated first with cessation of the deposit of bone and later with erosion of the trabeculae of bone and calcified cartilage.

Syphilitic periostitis is rare, but may accompany advanced osteochondritis. It results in a layer of bone and red marrow or rarely granulation tissue being deposited outside the original corticalis.

Congenital syphilitic disease of the bone is not a general systemic condition, but is due to the local presence of the spirochetes. The older the child the fewer the portions of bone affected. The femur, tibia, humerus, and ribs are sites of election.

NORMAN F. MILLER.

**Lindig:** Glycosuria in the Newborn. *Klinische Wochenschrift*, 1922, i, 995.

The author repeated the work of Hoeniger upon the excretion of sugar in the urine of newborn children delivered by forceps. The latter found a "temporary traumatic" glycosuria in each of four children thus delivered, the sugar excretion lasting only two to four days. He considers this to be due to the sudden application of force to the head, analogous to puncture glycosuria. Sugar is not found in the urine of spontaneously delivered children, even though the labor be tedious and the compression of the head prolonged. Lindig, however, does not think that the question can be settled so simply, as the causes of glycosuria are legion and the mechanism often complicated. He notes that Kausch has reported that other traumatisms, even when not acting on the skull, can produce glycosuria; so can anesthesia, anoxemia, etc. He found sugar persisting in the urine for seven days of only three out of twenty-four male children delivered by forceps, and hence concludes that the question is still an open one. A further report based on a more exhaustive study, is promised.

E. L. KING.

**Hartmann, Henri:** Pyloric Stenosis in the Nursling. *Gynécologie et Obstétrique*, 1922, v, 307.

The author emphasizes the importance of distinguishing between a true hypertrophic muscular stenosis and a pyloric spasm. Operative procedure in the two cases is entirely different. The submucous pylorotomy is easy and meets all indications for the pyloric spasm. In cases of hypertrophic stenosis the operation is more serious. It should be done as early as possible and consists preferably in a gastroenterostomy.

F. L. ADAIR.

**Browne, F. J.:** Pneumonia Neonatorum. *British Medical Journal*, March 25, 1922, No. 3195, p. 469.

The author quotes 80 cases of infantile deaths in which 21 or 26.25 per cent were due to pneumonia. Over half of these were in premature infants. Ages varied from 8 hours to 5 weeks. Five of the infants were syphilitic. Some of the infants, especially the premature ones, had atelectatic areas in the lungs. It is probable that premature rupture of the membranes predisposes to pneumonia. A child may be born not only infected but even suffering from pneumonia in an advanced stage. The infant has little defensive reaction. At post-mortem examinations the disease may be missed if microscopic examination of the lungs is not made.

F. L. ADAIR.

**Miller:** Omphalorrhagia with a Record of Two Cases. Transactions of the Edinburgh Obstetrical Society, Session lxxxi, 1921-1922, p. 97.

Congenital obliteration of the bile duct is accompanied by hemorrhages in 80% of cases. Icterus was associated with 77 out of 178 cases of omphalorrhagia collected by Jenkins. Systemic infections (frequently developing in utero) have been associated with omphalorrhagia on various occasions. No characteristic organism has been isolated. Syphilis may be a factor through its effect on the blood vessels and liver, or indirectly through lowered resistance to bacterial invasion. Hemophilia is seldom a factor in cord hemorrhage. Hemorrhage from the cord was noted only 9 times in 576 hemophilias.

The prognosis in true omphalorrhagia is grave, 84% of the recorded cases dying. The treatment is both general and local. Syphilis should be treated vigorously during pregnancy. Umbilical infections are treated along surgical lines. Hemorrhage is controlled by purse string suture or acupressure with crossed needles. More important, both in replacing lost blood and supplying elements facilitating coagulation, is the use of blood transfusion. Transfusion should be done early and often. Locally, styptics and coagulants are of little or no value and frequently waste valuable time.

II. W. SHUTTER.

**Alam:** A Case of Abnormal Labor (Hydrothorax and Ascites in the Fetus). Indian Medical Gazette, 1922, lvii, 260.

The author reports the case of a multipara, 32 years of age, in her sixth pregnancy. She had five normal labors, with five children living and well. She gives a history of becoming easily fatigued on exertion with a tightness and fullness in the abdomen and chest. No fever or vomiting at any time. Very irritable and quarrelsome, even behaving like a mad person at times. The present labor started in the ninth lunar month. The pains were very short and at long intervals, felt only at the pubes. When seen, the woman was in great distress having been in labor for two days. On examination the abdomen was very large with two small feet protruding from the vagina. The legs were found broken and on pulling they were broken off and removed. The patient was put under chloroform and the uterus explored. A small head was found with a large sac-like body. Version was performed with difficulty and the head delivered by forceps. Pulling on the head caused it to separate easily, leaving the body in the uterus. The hands were delivered and broken off. Clavicles were also broken in attempting to extract the body. The thorax was then perforated with the fingers and four pints of clear colored fluid came out. The diaphragm was next perforated, and more than five pints of clear ascitic fluid escaped. The sac-like body could finally be delivered. Placenta had to be stripped off and an intrauterine douche given. Examination of the mutilated body showed marked malformations of all structures. The patient developed bronchitis but recovered rapidly and was up on the ninth day without any further trouble.

F. J. SOUBA.

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### Item

The forty-eighth annual meeting of the American Gynecological Society will be held in Hot Springs, Va., May 21, 22 and 23, 1923.

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